FCC CFR47 PART 24 SUBPART E BROADBAND

CERTIFICATION REPORT

FOR

1930MHz – 1990MHz SINGLE CHANNEL POWER AMPLIFIER

MODEL: SPA9321-30C

FCC ID: E675JS0065

REPORT NUMBER: 03U1802-1

ISSUE DATE: 02/13/03

Prepared for
POWERWAVE TECHNOLOGIES, INC.
1117 WINDFIELD WAY, SUITE 100
EL DORADO HILLS, CA 95762

Prepared by
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TABLE OF CONTENT

COMPLIANCE CERTIFICATION SERVICES DOCUMENT NO:CCSUP4031A
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1. TEST RESULT CERTIFICATION

COMPANY NAME: POWERWAVE TECHNOLOGIES, INC.
1117 WINDFIELD WAY, SUITE 100
EL DORADO HILLS, CA 95762

EUT DESCRIPTION: 1930MHz – 1990MHz SINGLE CHANNEL POWER AMPLIFIER

MODEL NUMBER: SPA9321-30C

DATE TESTED: FEBRUARY 10, 2003 – FEBRUARY 12, 2003

EQUIPMENT TYPE	INTENTIONAL RADIATOR 1930-1990 MHz (part 24)
MEASUREMENT PROCEDURE	ANSI 63.4 / 2001, TIA/EIA 603
PROCEDURE	CERTIFICATION
FCC RULE	CFR 47 PART 24 Subpart E

Compliance Certification Services, Inc. tested the above equipment for compliance with the requirement set forth in CFR 47, PART 24 Subpart E-Broadband PCS. The equipment in the configuration described in this report, shows the measured emission levels emanating from the equipment do not exceed the specified limit. **Note**: This document reports conditions under which testing was conducted and results of tests performed. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document.

Test By:

FRANK IBRAHIM
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

Released For CCS By:

THU CHAN
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

2. EUT DESCRIPTION

1930 – 1990 MHz, 30W, Single Channel RF Power Amplifier, with GSM/EDGE modulations schemes.

3. FACILITIES, LABORATORY AND ACCREDITATION

3.1. FACILITIES

The open area test sites and conducted measurement facilities used to collect the radiated data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 16.

3.2. LABORATORY ACCREDITATION

The laboratory and associated test facilities used to perform radiated and conducted emissions tests are accredited by National Voluntary Laboratory Accreditation Program for the specific scope of accreditation under Lab Code: 200065-0 to perform Electromagnetic Interference tests according to FCC PART 15 AND CISPR 22 requirements. In addition, the test facilities are listed with Federal Communications Commission (reference no: 31040/SIT (1300B3) and 31040/SIT (1300F2)).

No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government.

3.3. LIST OF ACCREDITATIONS

Country	Agency	Scope of Accreditation	Logo
USA	NVLAP*	FCC Part 15, CISPR 22, AS/NZS 3548,IEC 61000-4-2, IEC 61000-4-3, IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-6, IEC 61000-4-8, IEC 61000-4-11, CNS 13438	NVLAP 200065-0
USA	FCC	3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements	FC 1300
Japan	VCCI	CISPR 22 Two OATS and one conducted Site	VCCI R-1014, R-619, C-640
Norway	NEMKO	EN50081-1, EN50081-2, EN50082-1, EN50082-2, IEC61000-6-1, IEC61000-6-2, EN50083-2, EN50091-2, EN50130-4, EN55011, EN55013, EN55014-1, EN55104, EN55015, EN61547, EN55022, EN55024, EN61000-3-2, EN61000-3-3, EN60945, EN61326-1	N ELA 117
Norway	NEMKO	EN60601-1-2 and IEC 60601-1-2, the Collateral Standards for Electro-Medical Products. MDD, 93/42/EEC, AIMD 90/385/EEC	N ELA-171
Taiwan	BSMI	CNS 13438	商檢 SL2-IN-E-1012
Canada	Industry Canada	RSS210 Low Power Transmitter and Receiver	Canada IC2324 A,B,C, and F

*No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government.

4. CALIBRATION, METHODOLOGY AND UNCERTAINTY

4.1. EQUIPMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

4.2. TEST METHODOLOGY

Conducted and radiated testing were performed according to the procedures documented on chapter 13 of ANSI C63.4 and FCC CFR 47 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055 and 2.1057.

Receiving equipment (i.e., receiver, analyzer, quasi-peak adapter, pre-selector) and LISNs conform to CISPR specifications for “Radio Interference Measuring Apparatus and Measurement Methods,” Publication 16.

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Radiated Emission	
30MHz – 200 MHz	+/- 3.3dB
200MHz – 1000MHz	+4.5/-2.9dB
1000MHz – 2000MHz	+4.6/-2.2dB
Power Line Conducted Emission	
150kHz – 30MHz	+/-2.9

Any results falling within the above values are deemed to be marginal.

4.4 TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Name of Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Due Date**
SA Display Section 1	**HP**	**85662A**	**3026A19146**	**5/23/03**
SA RF Section, 22 GHz	**HP**	**85660B**	**3014A06685**	**6/1/03**
Quasi-Peak Adaptor	**HP**	**85650A**	**3145A01654**	**6/1/03**
Preamplifier, 1 ~ 26.5 GHz	**HP**	**8449B**	**3008A00369**	**6/30/03**
Antenna, Horn 1 ~ 18 GHz	**EMCO**	**3115**	**6739**	**1/31/03**
Antenna, Biconical	**Eaton**	**94455-1**	**1197**	**3/29/03**
Antenna, Log Periodic 200 ~ 1000 MHz	**EMCO**	**3146**	**2120**	**3/29/03**
Preamplifier, 1300 MHz	**HP**	**8447D**	**2944A06589**	**8/22/03**
Antenna, Horn 1 ~ 18 GHz	**EMCO**	**3115**	**9001-3245**	**NCR**
Signal Generator	**HP**	**83732B**	**US34490599**	**3/29/03**
Antenna, Horn 18 ~ 26 GHz	**ARA**	**MWH-1826/B**	**1049**	**11/7/03**

5. APPLICABLE RULES

5.1. RF POWER OUTPUT §2.1046

§ 24.232- POWER LIMIT

§24.232(a) Maximum Peak output power for base station transmitters should not exceed 100 Watts EIRP (equivalent isotropically radiated power).

§24.232(b) Mobile stations are limited to 2 Watts EIRP.

5.2. MODULATION CHARACTERISTICS §2.1047

Not applicable; EUT is an amplifier.

5.3. OCCUPIED BANDWIDTH §2.1049

§2.1049(i) Transmitters designed for other types of modulation – when modulated by an appropriate signal of sufficient amplitude to be representative of the type of service in which used. A description of the input signal should be supplied.

5.4. SPURIOUS EMISSIONS AT ANTENNA TERMINALS §2.1051

§ 24.238- EMISSION LIMITS

§24.238(a) The magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under conditions specified in the instruction manual and/or alignment procedure, shall not be less than 43+10 log (mean output power in watts) dBc below the mean power output outside a licensee's frequency block (-13dBm).

5.5. FIELD STRENGTH OF SPURIOUS RADIATION §2.1053

§ 24.238- EMISSION LIMITS

§24.238(a) The magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under conditions specified in the instruction manual and/or alignment procedure, shall not be less than 43+10 log (mean output power in watts) dBc below the mean power output outside a licensee's frequency block (-13dBm).

5.6. FREQUENCY STABILITY §2.1055

Not Applicable ; EUT is an amplifier.

5.7 FREQUENCY RANGE TO BE INVESTIGATED §2.1057

§2.1057(a) In all of the measurements set forth in §2.1051 and §2.1053, the spectrum shall be investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to at least the frequency shown below:
(1) If the equipment operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
(2) If the equipment operates at or above 10 GHz and below 30 GHz:
to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.

(3) If the equipment operates at or above 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 200 GHz, whichever is lower.
§2.1057(b) Particular attention should be paid to harmonics and sub-harmonics of the carrier frequency as well as to those frequencies removed from the carrier by multiples of the oscillator frequency. Radiation at the frequencies of multiplier stages should also be checked.
§2.1057(c) The amplitude of spurious emissions, which are attenuated more than 20 dB below the permissible value, need not be reported.
§2.1057(d) Unless otherwise specified, measurements above 40 GHz shall be performed using a minimum resolution bandwidth of 1 MHz.

Spec limit: Frequency investigation range from 30 MHz to 20 GHz.

5.8. RADIATED EMISSIONS, FCC PART 15, SECTIONS 209 & 205

Radiated Emissions Limits:

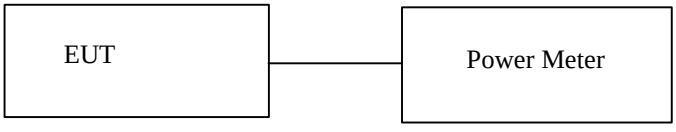
Radiated Emission Technical Requirements For Class B Device		
Frequency (MHz)	**FCC limits @ 3 meter Quasi-Peak/dBuV/m**	**CISPR 22 limits @10 meter Quasi-Peak/dBuV/m**
30 –88	40.0	30.0
88-216	43.5	30.0
216-230	46.0	30.0
230-960	46.0	37.0
960-1000	54.0	37.0
Above 1000	54.0	Not Applicable

Note: Power Line Conducted Emissions test is not applicable because the EUT is DC powered.

6. TEST SETUP, PROCEDURES, AND RESULTS

6.1.1 RF CONDUCTED POWER OUTPUT

TEST SETUP



TEST PROCEDURE

The EUT was connected to a signal generator, an output signal was injected to make sure the amplifier was operated at rated power, the reading at the power meter was confirmed to be 44.8 dBm.

RESULT

No non-compliance noted, see table below.

Channel	Frequency	Conducted Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	1.930	44.81	50	-5.19
Middle	1.960	44.81	50	-5.19
High	1.990	44.81	50	-5.19

6.1.2 RF RADIATED POWER OUTPUT

TEST PROCEDURE:

1). On a test site, the EUT shall be placed on a turntable, and in the position closest to the normal use as declared by the user.
2). The test antenna shall be oriented initially for vertical polarization located 1m from the EUT to correspond to the frequency of the transmitter.
3). The output of the test antenna shall be connected to the measuring receiver and either a peak or average detector was used for the measurement as indicated on the report. The detector selection is based on how close the emission level was approaching the limit.
4). The transmitter shall be switched on, if possible, without the modulation and the measurement receiver shall be tuned to the frequency of the transmitter under test.
5). The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
6). The transmitter shall than be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
7). The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.
8). The maximum signal level detected by the measuring receiver shall be noted, use 1MHz setting for RBW and VBW.
9). The transmitter shall be replaced by a substitution antenna.
10). The substitution antenna shall be oriented for vertical polarization.
11). The substitution antenna shall be connected to a calibrated signal generator.

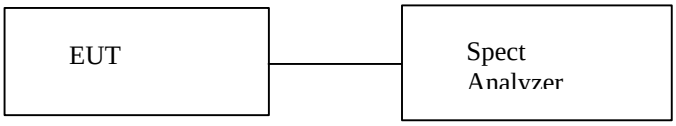
12). If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
13). The test antenna shall be raised and lowered through the specified range of the height to ensure that the maximum signal is received.
14). The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuation setting of the measuring receiver.
15). The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.
16). The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization.
17). The measure of the effective radiated power is the larger of the two levels recorded, at the input to the substitution antenna, corrected for the gain of the substitution antenna if necessary.

RESULT

This test is not applicable as the EUT is an RF Amplifier and does not include an antenna.

6.2. OCCUPIED BANDWIDTH

TEST SETUP



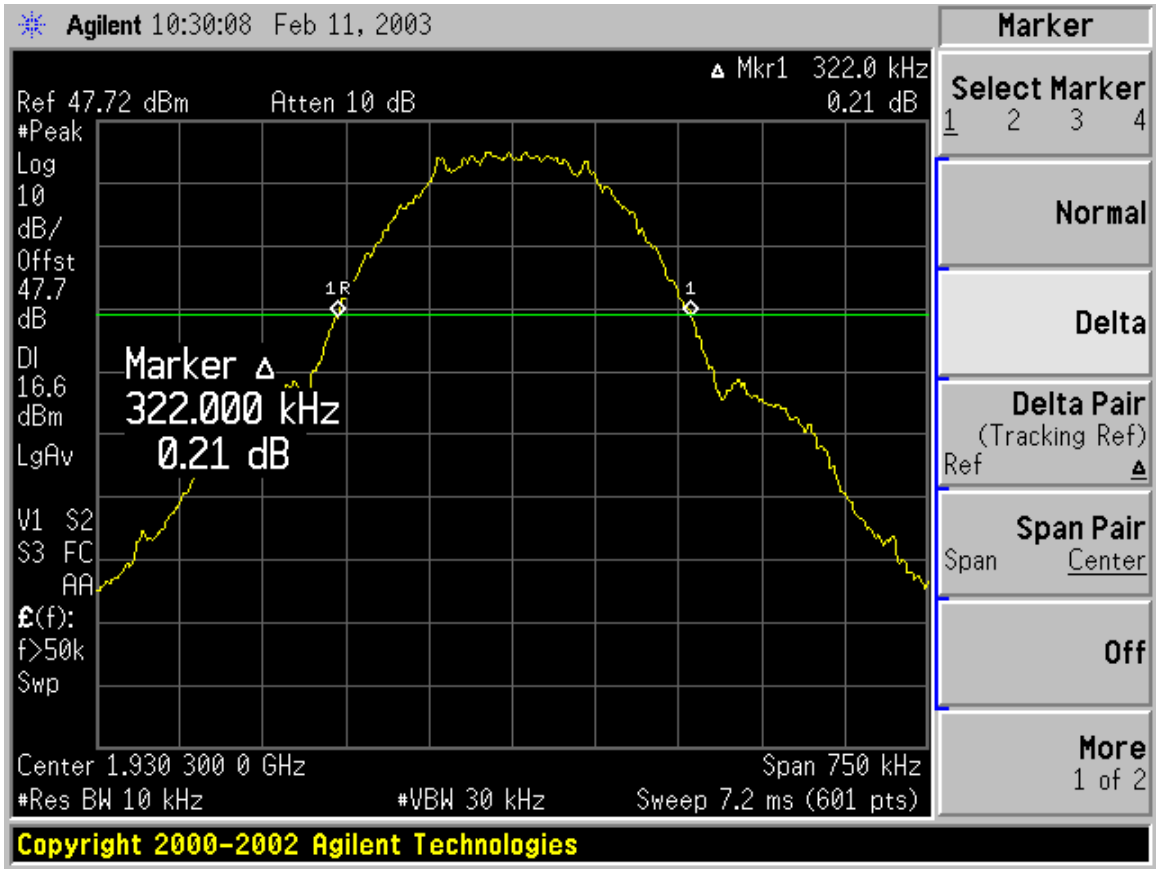
TEST PROCEDURE

The EUT's output RF connector was connected with a short cable to the spectrum analyzer, RES BW was set to about 1% of emission BW , -26 dBc display line was placed on the screen, the occupied BW is the delta frequency between the two points where the display line intersects the signal trace. 26dB BW was measured for low, middle and high channels on both RF input and output ports of the EUT.

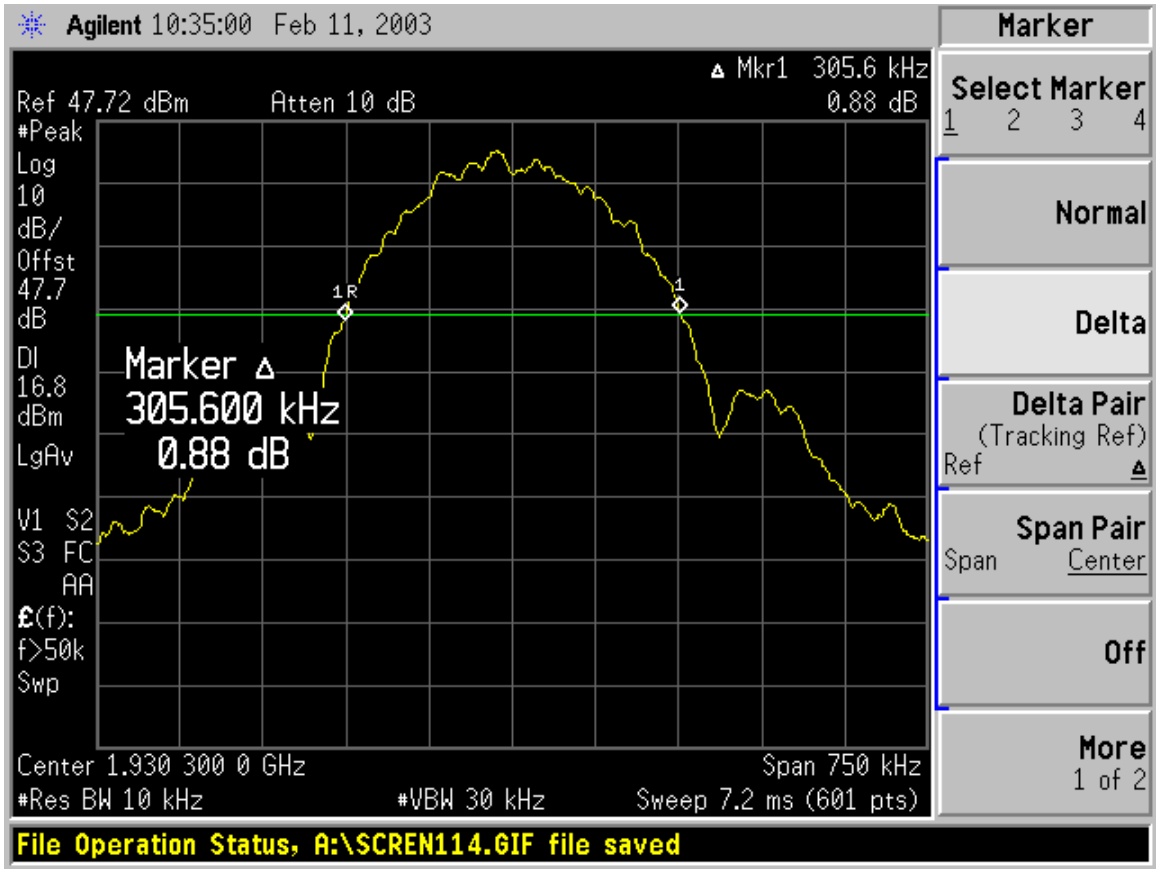
RESULT

Reporting requirement only.

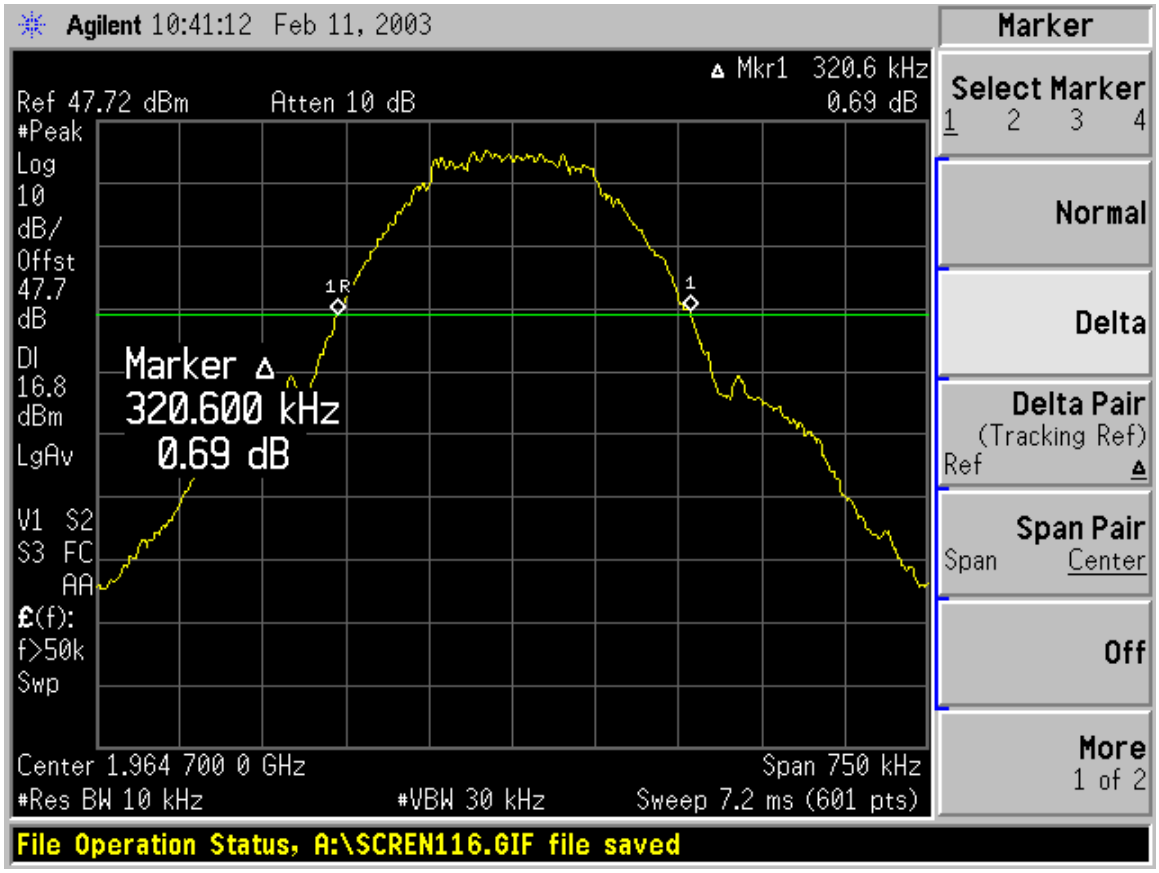
Low Channel, GSM, RF Output



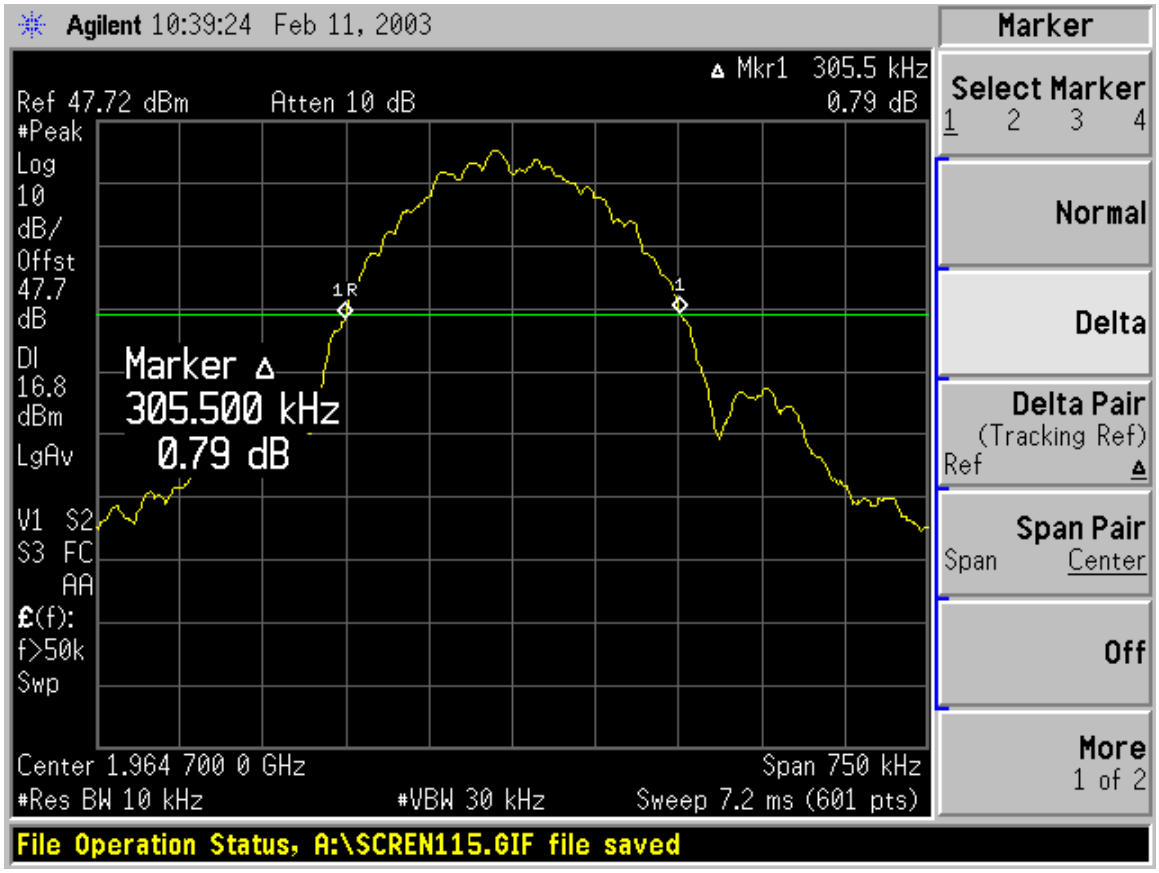
Low Channel, EDGE, RF Output



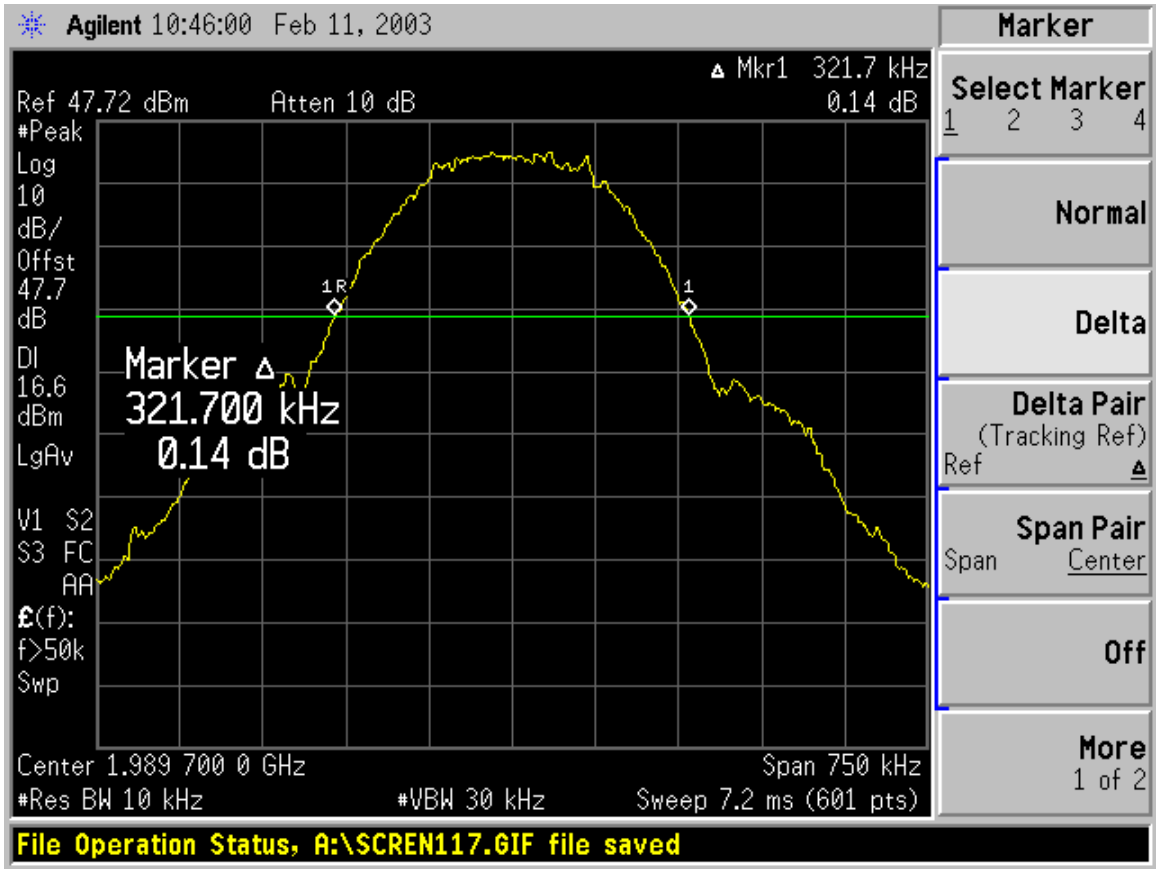
Middle Channel, GSM, RF Output



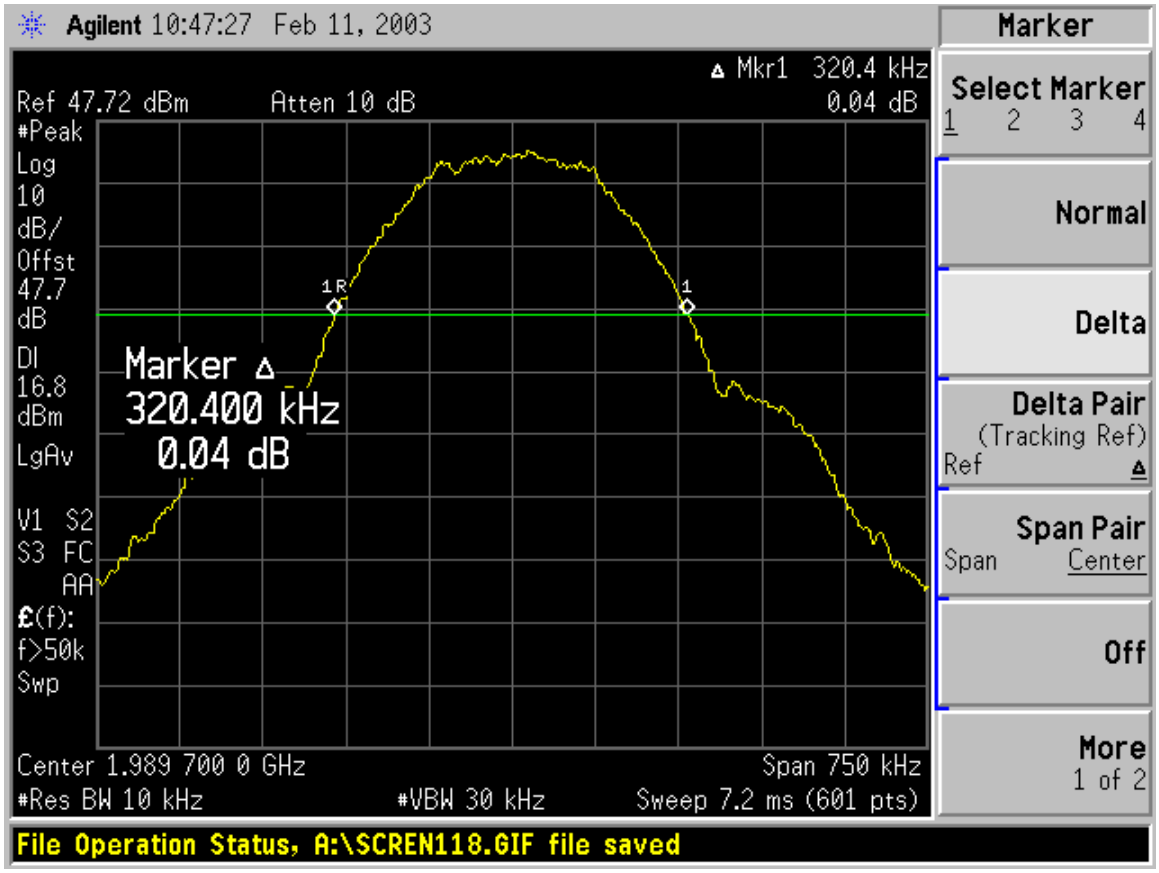
Middle Channel, EDGE, RF Output



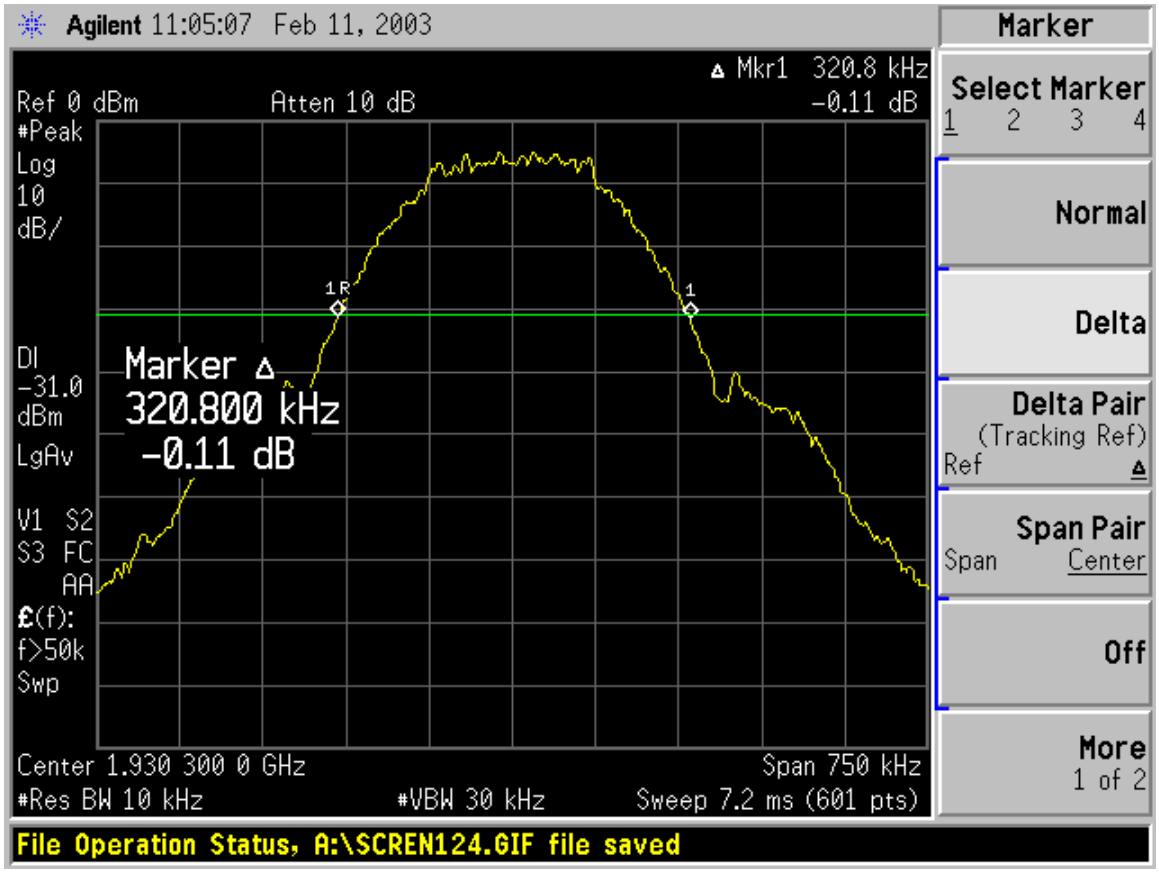
High Channel, GSM, RF Output



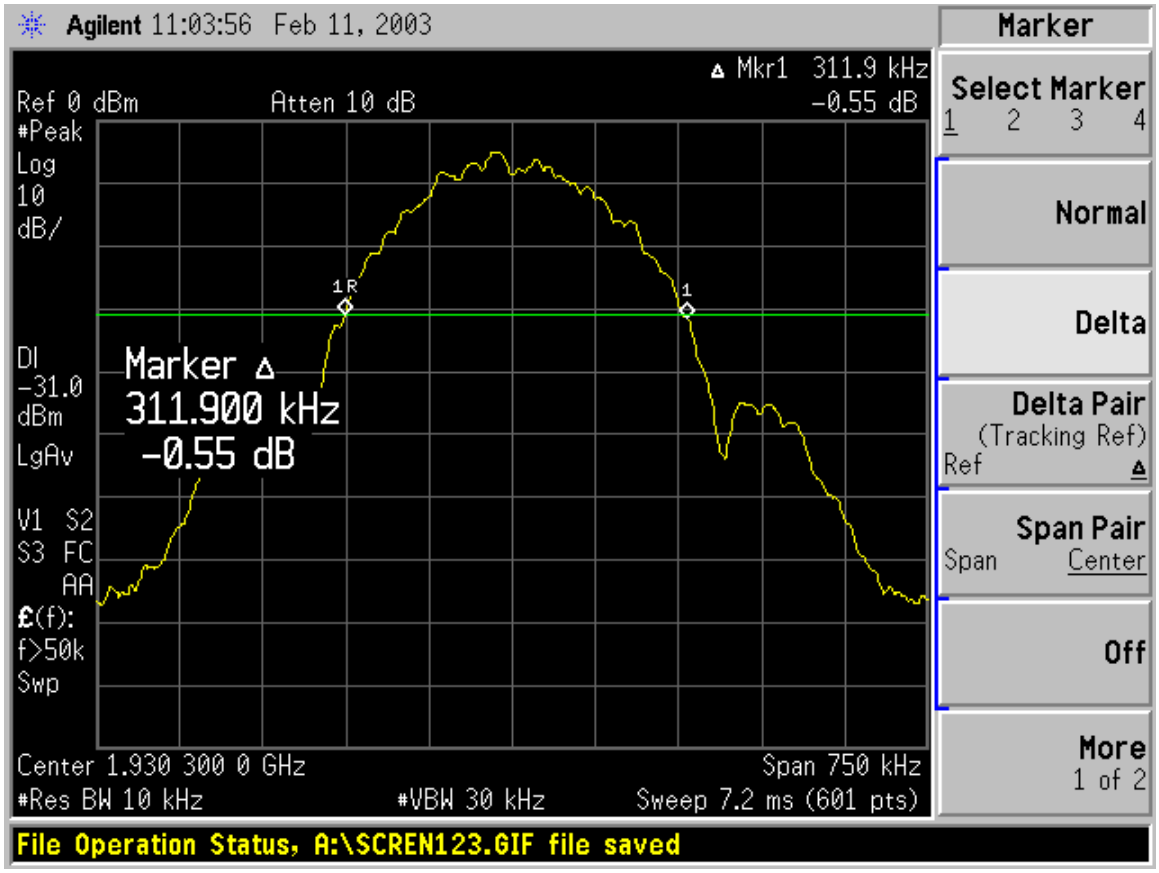
High Channel, EDGE, RF Output



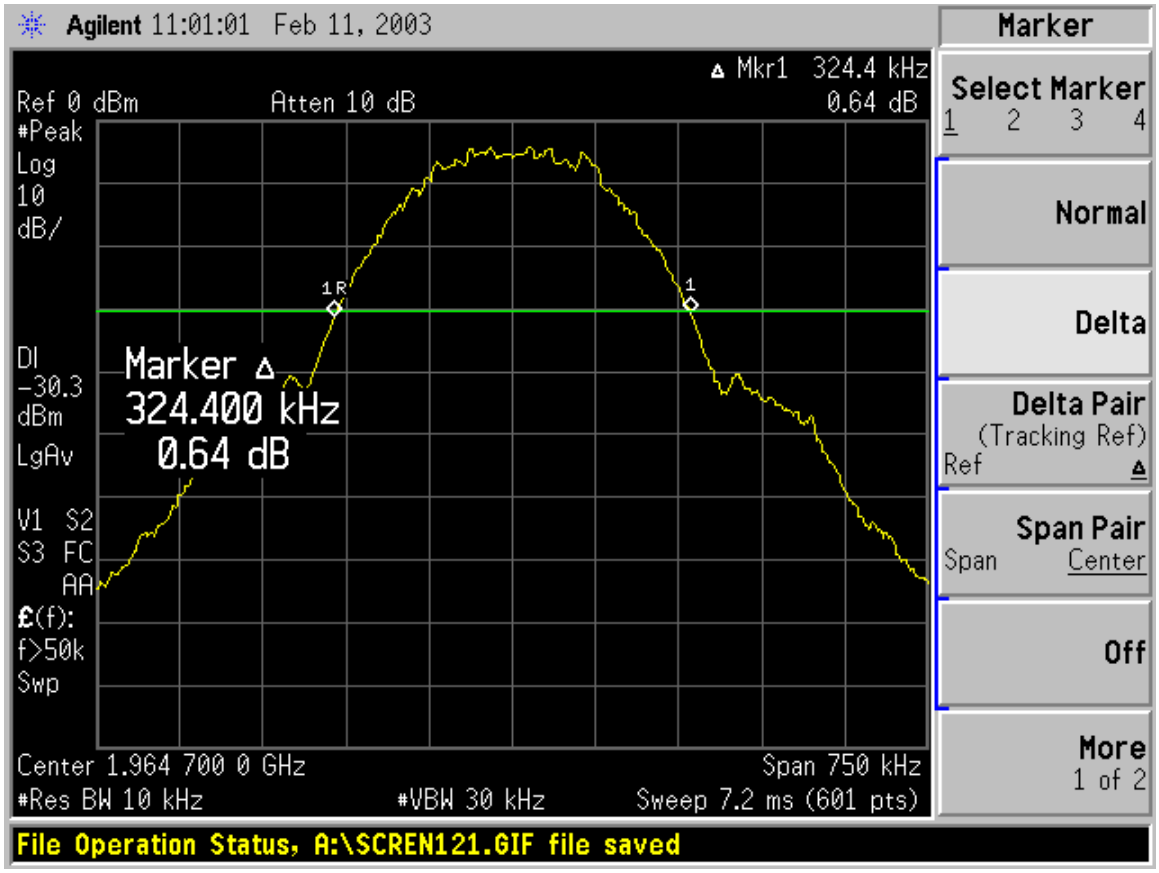
Low Channel, GSM, RF Input



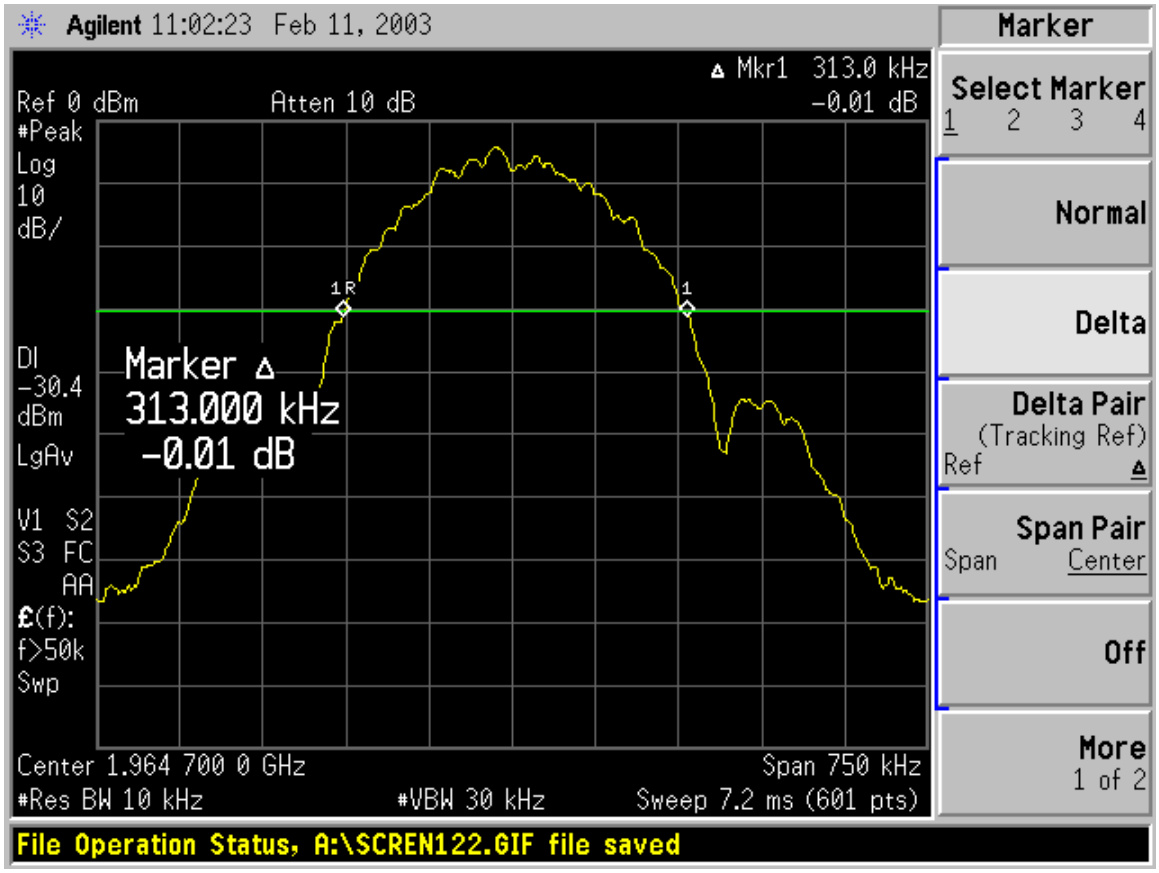
Low Channel, EDGE, RF Input



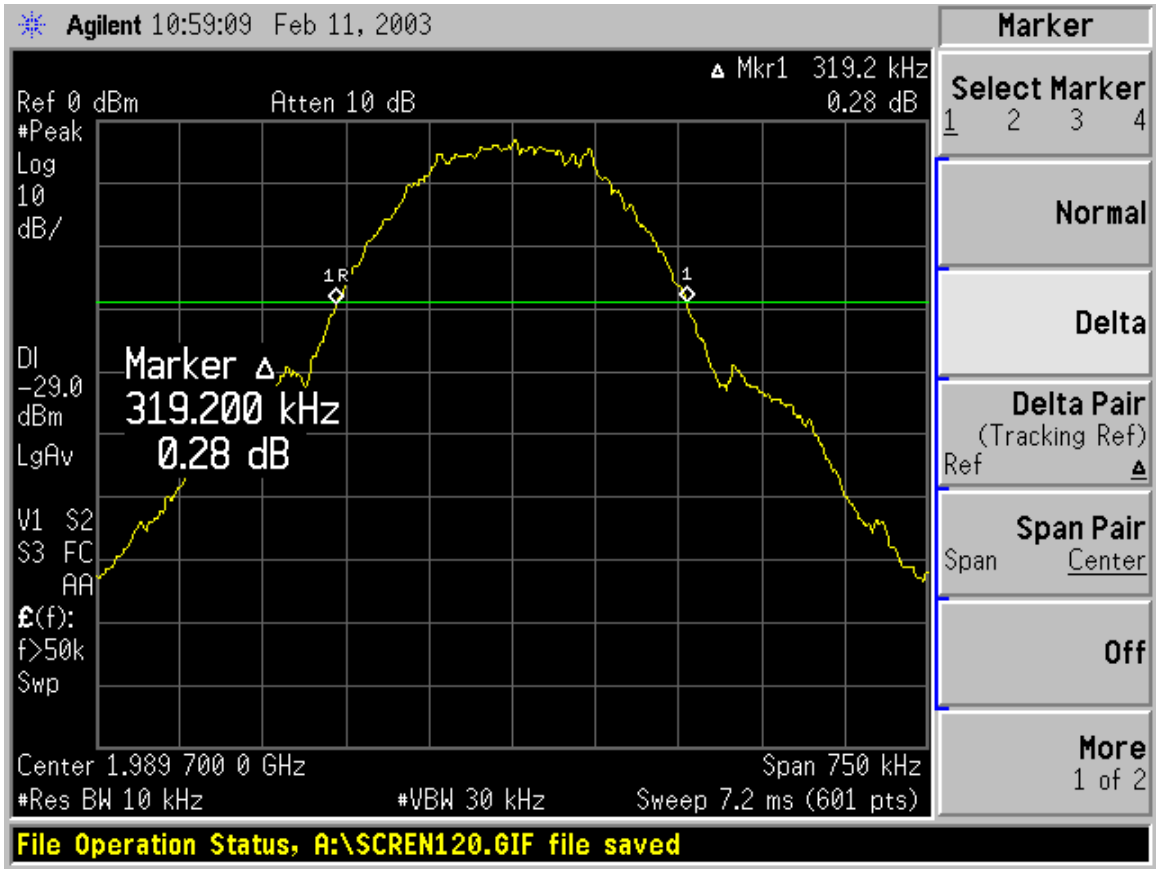
Middle Channel, GSM, RF Input



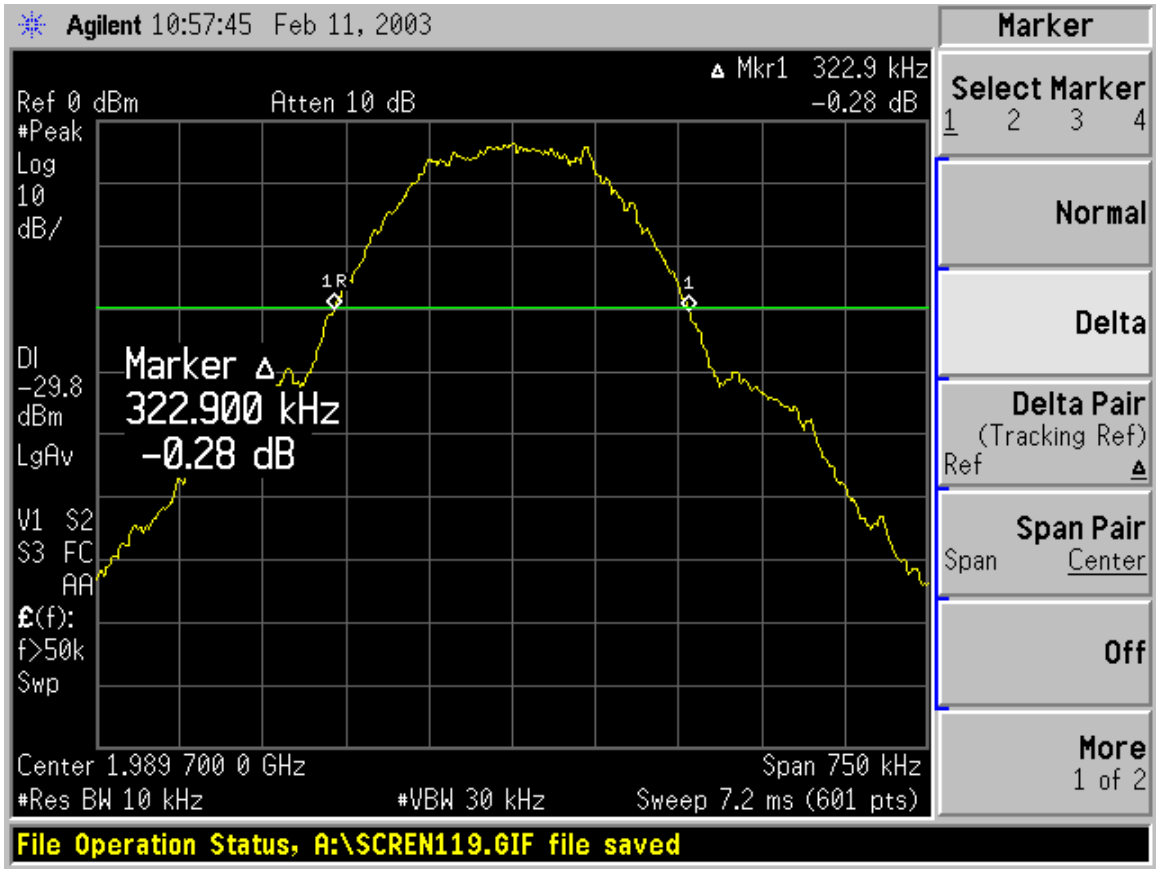
Middle Channel, EDGE, RF Input



High Channel, GSM, RF Input

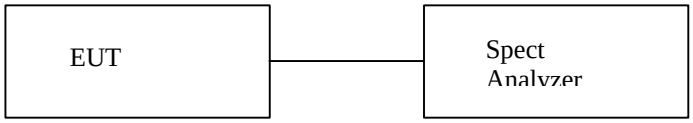


High Channel, EDGE, RF Input



6.3. SPURIOUS EMISSIONS AT ANTENNA TERMINAL

TEST SETUP



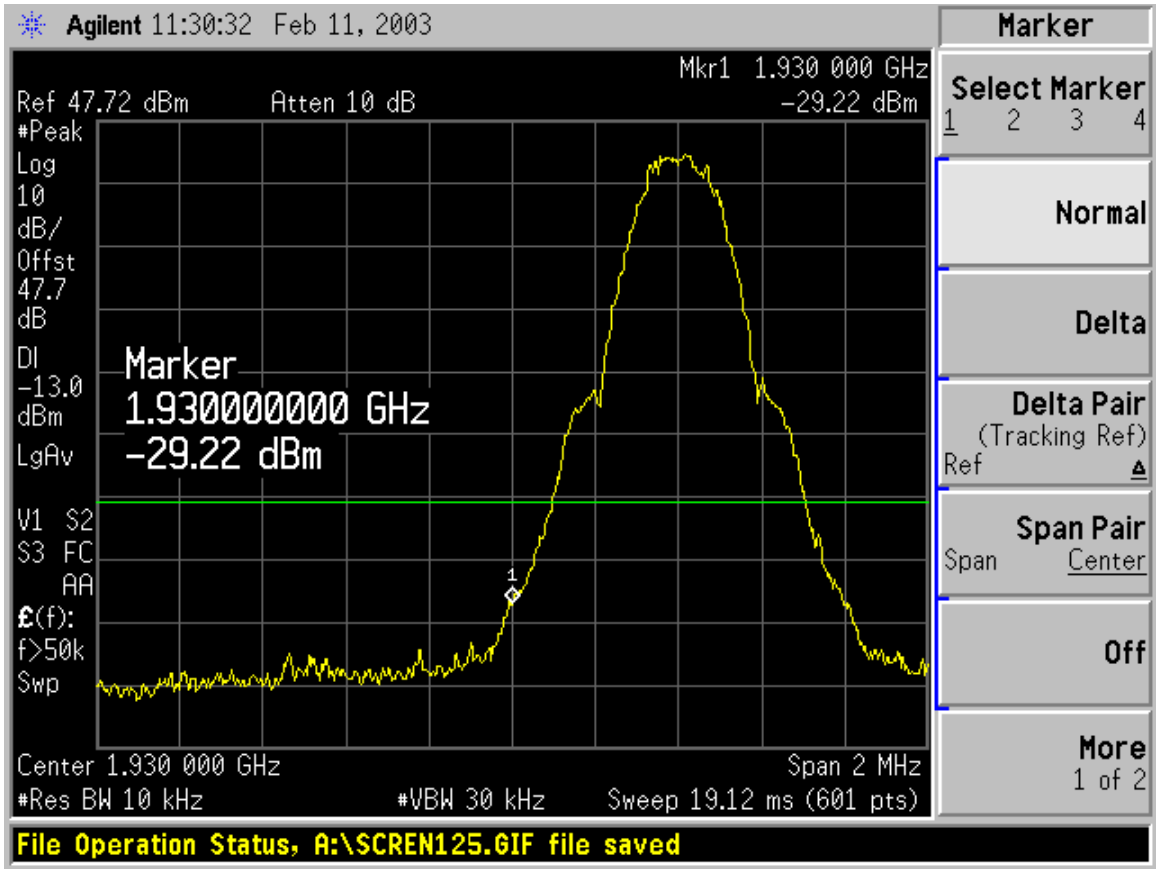
TEST PROCEDURE

EUT's RF output connector is connected to the spectrum analyzer with a short cable, RBW was set to 1MHz and VBW to 1MHz, the spectrum of 30MHz to 20GHz was investigated for any spurious emissions, a close up investigation for band edges for the low and high channels was also investigated with RBW setting of 1% of emission BW, and VBW setting of 3 times RBW.

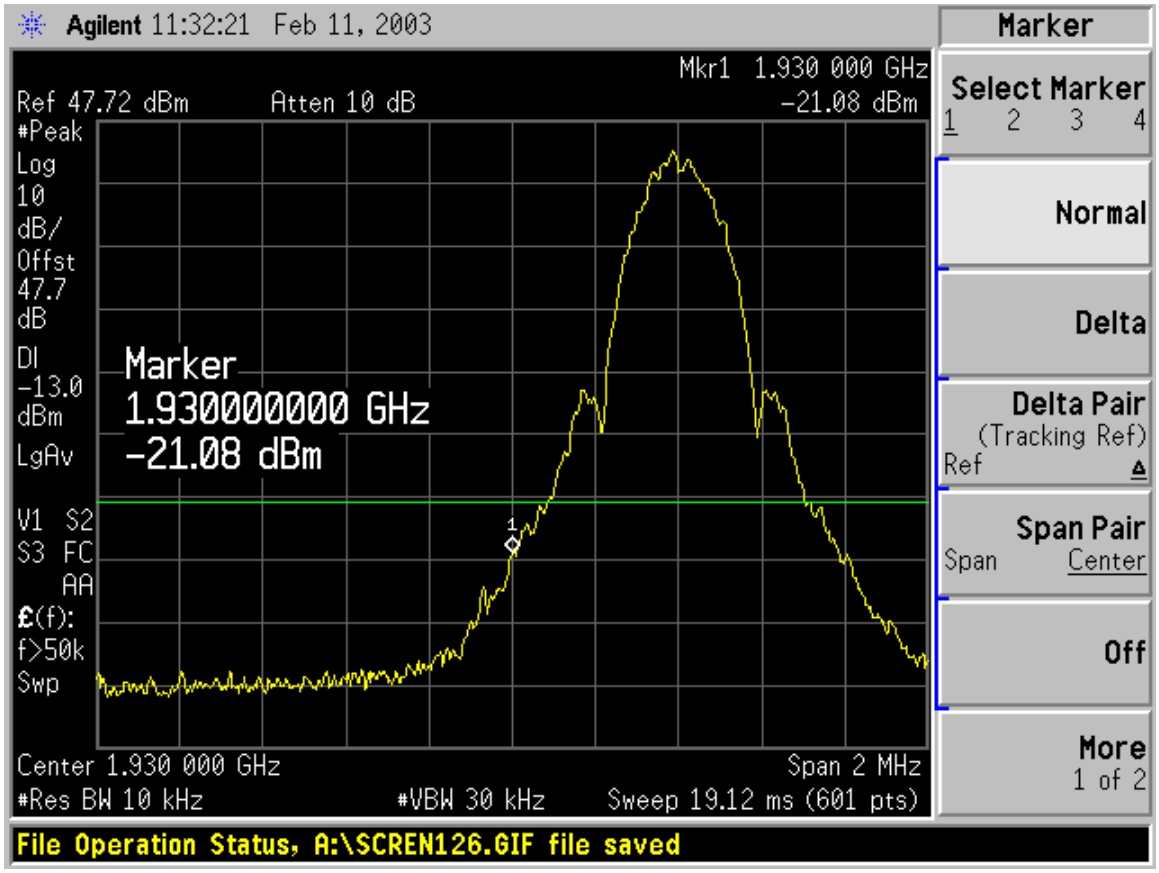
RESULT

No non-compliance noted.

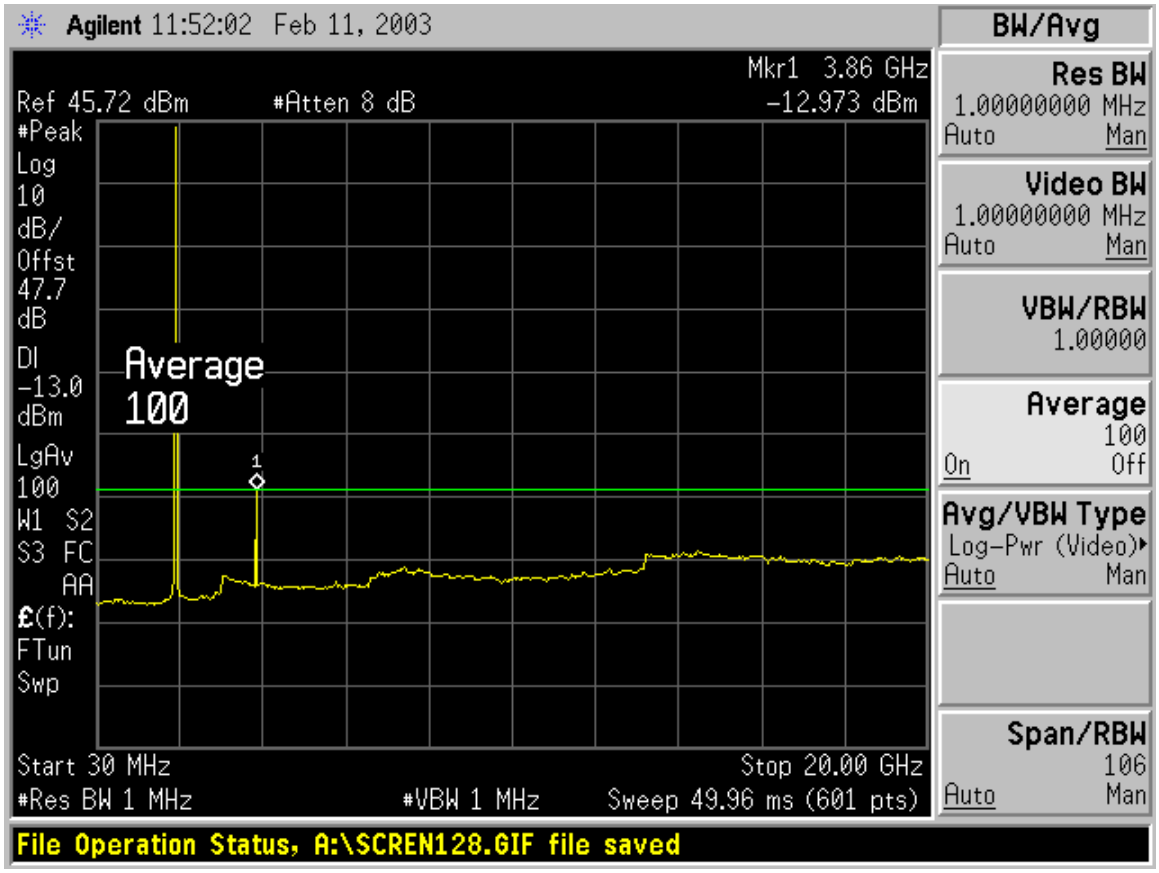
Low Channel, GSM, Bandedge



Low Channel, EDGE, Bandedge



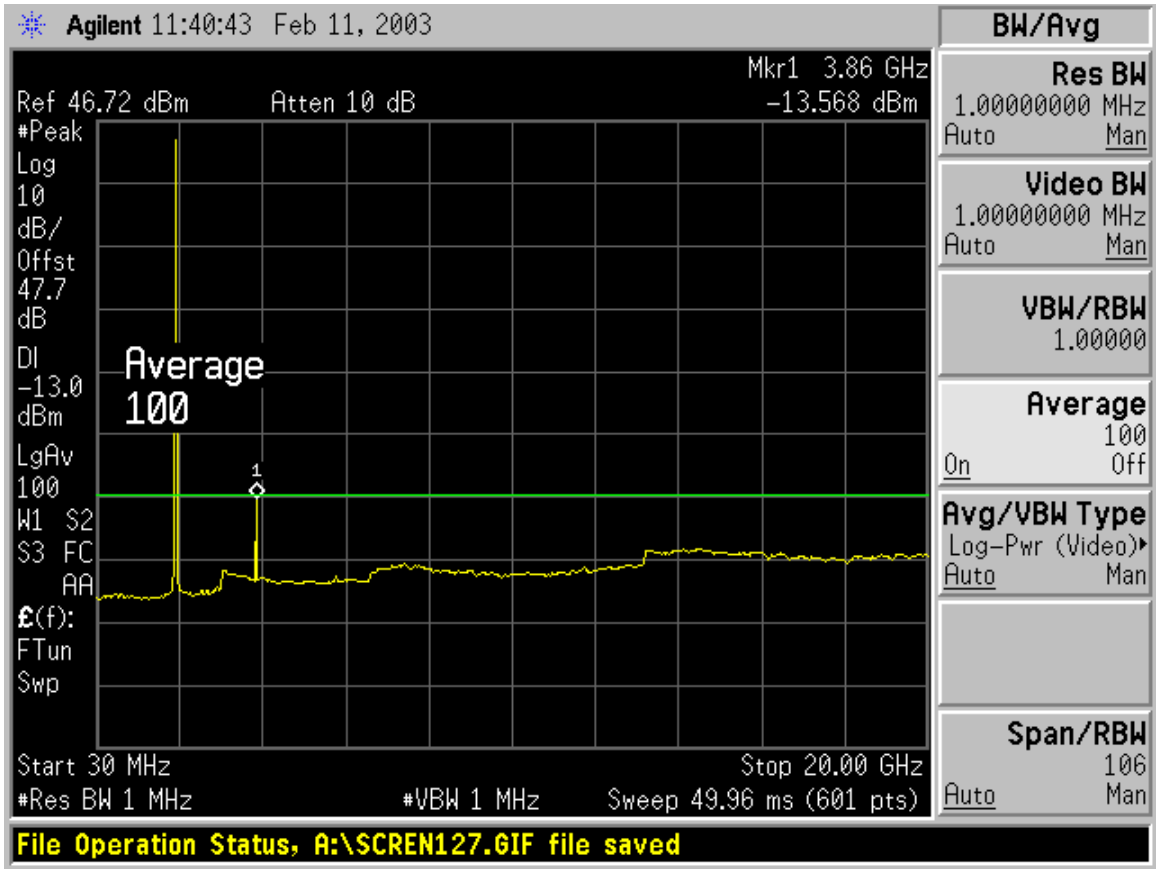
Low Channel, GSM, Conducted Spurious (30MHz – 20GHz)



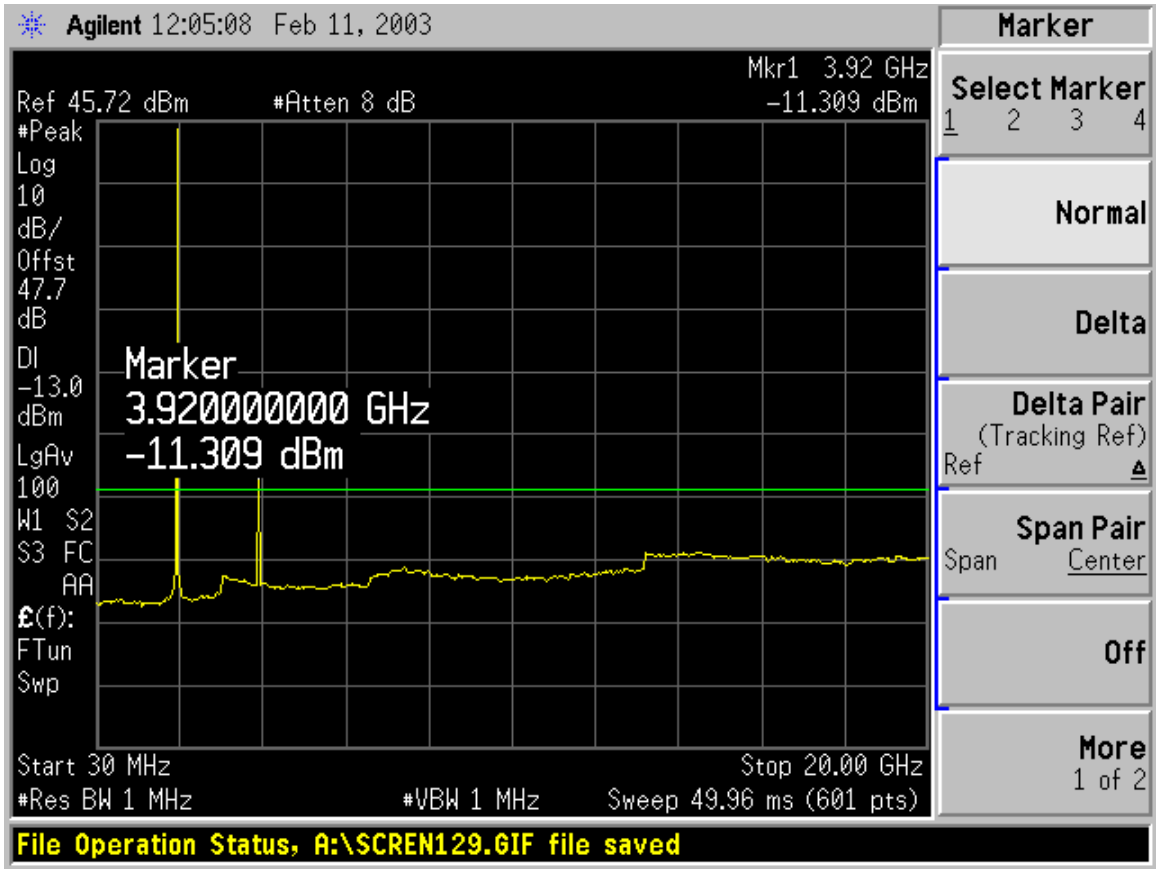
Note: One of the following filters needs to be used for the EUT to pass the conducted spurious in this plot;

Manufacturer	P/N
Nortel	**NTQA38KA**
Nortel	**NTQA51DA**
Nortel	**NTQA52BA**
Nortel	**NTQA52CA**
Nortel	**NTQA38LA**
Nortel	**NTQA51FA**
Nortel	**NTQA52BB**

Low Channel, EDGE, Conducted Spurious (30MHz – 20GHz)



Middle Channel, GSM, Conducted Spurious (30MHz – 20GHz)



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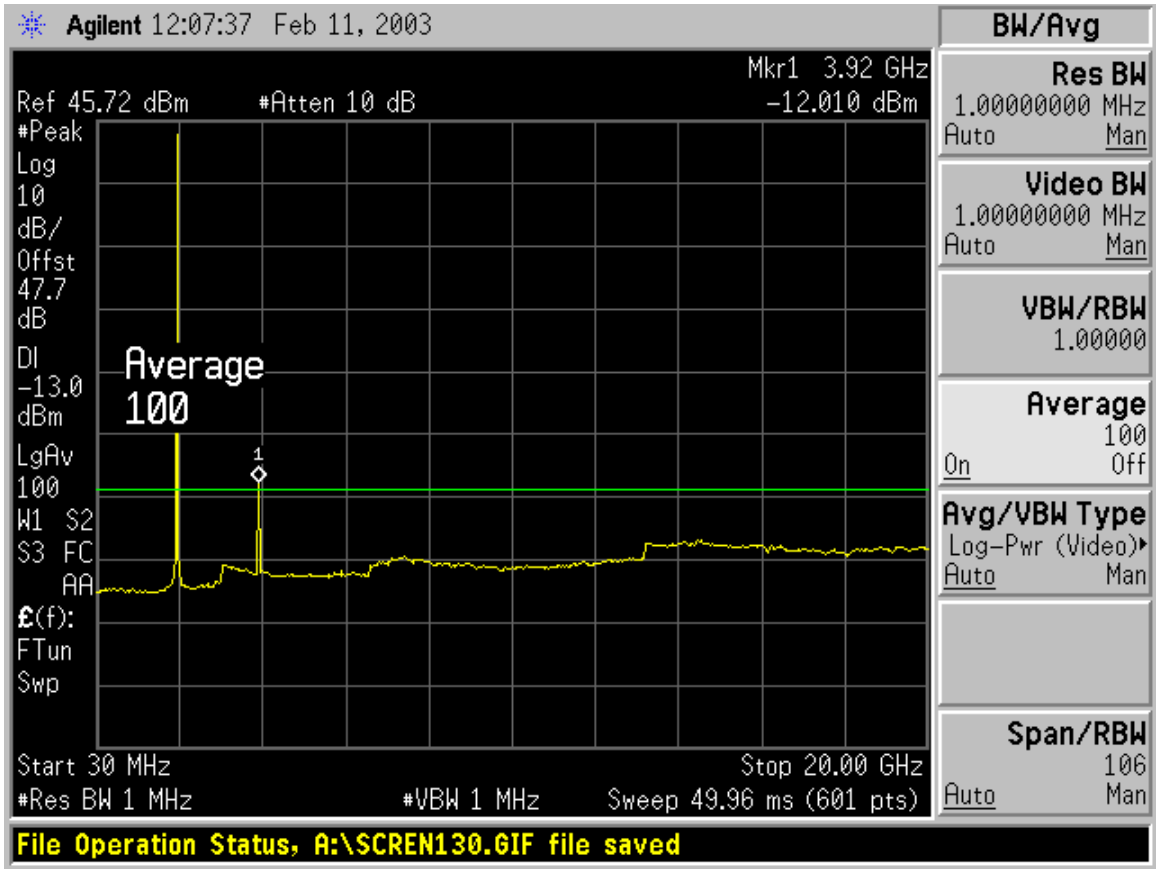
Middle Channel, EDGE, Conducted Spurious (30MHz – 20GHz)



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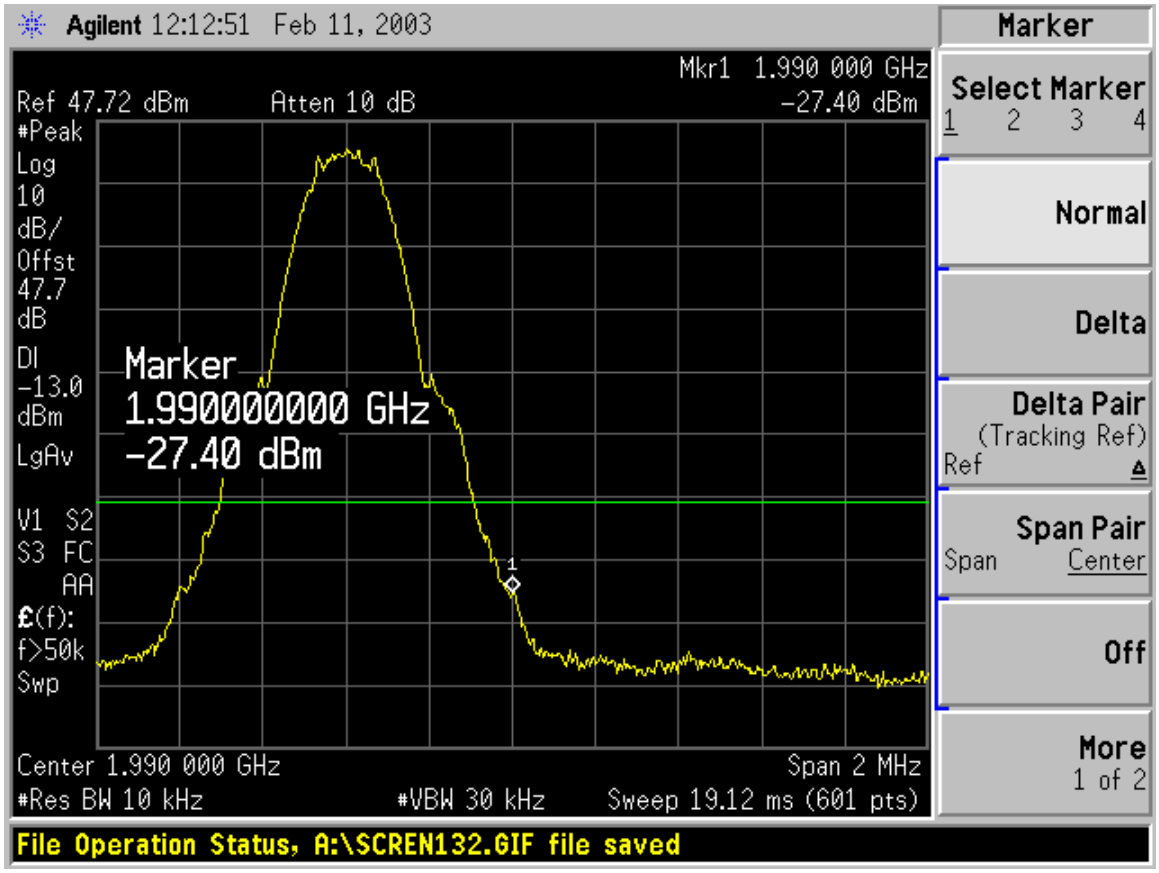
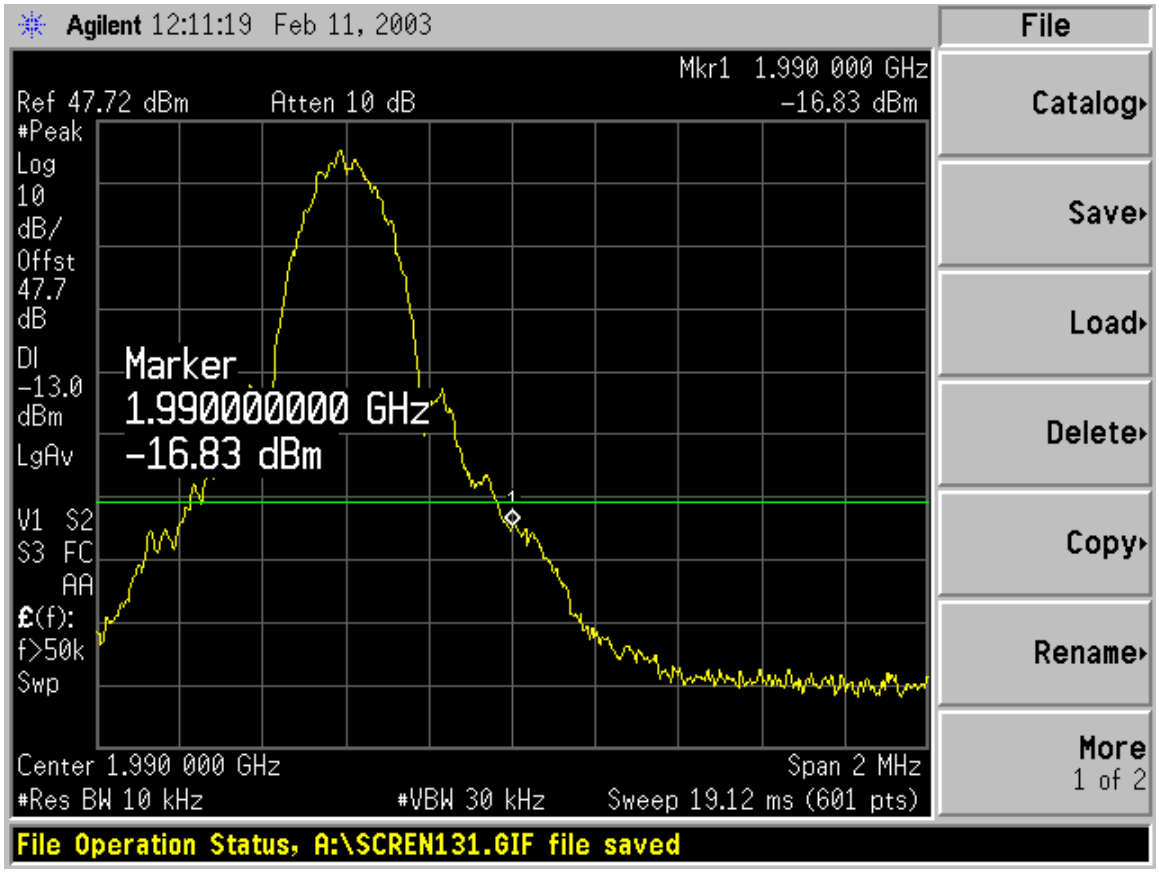
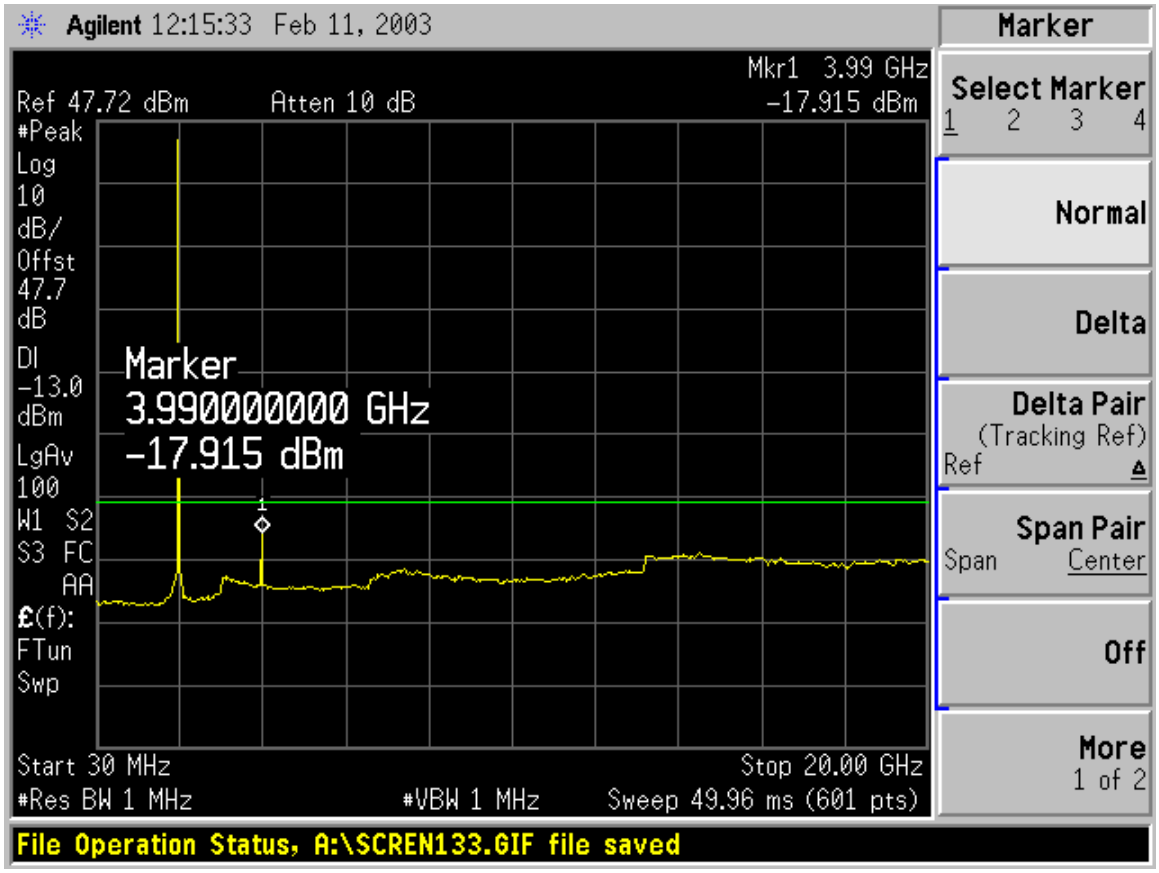
High Channel, GSM, Bandedge



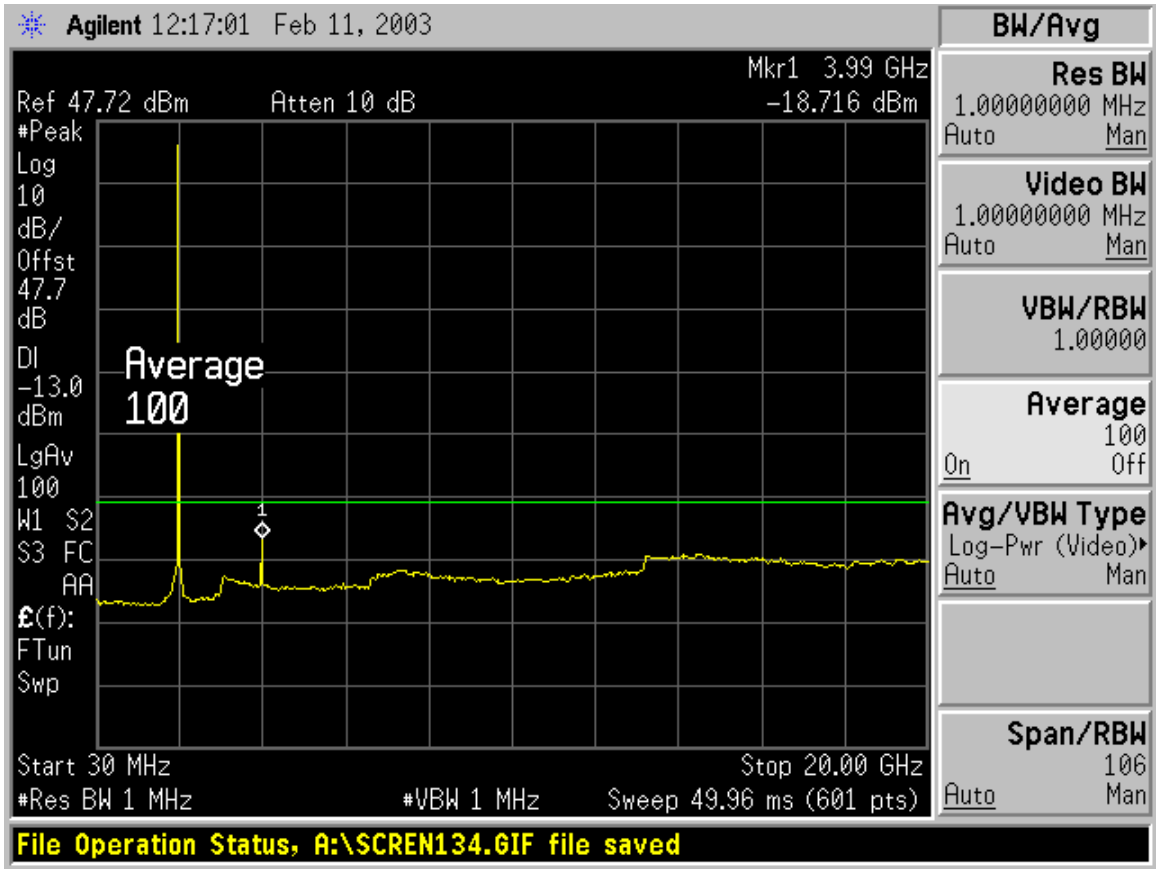
High Channel, EDGE, Bandedge



High Channel, GSM, Conducted Spurious (30MHz – 20GHz)



High Channel, EDGE, Conducted Spurious (30MHz – 20GHz)



6.4 FIELD STRENGTH OF SPURIOUS RADIATION

Detector Function Setting of Test Receiver

Frequency Range (MHz)	Detector Function	Resolution Bandwidth	Video Bandwidth
Above 1000	☒ Peak ☐ Average	☒ 1 MHz ☐ 1 MHz	☒ 1 MHz ☐ 10 Hz

TEST SETUP

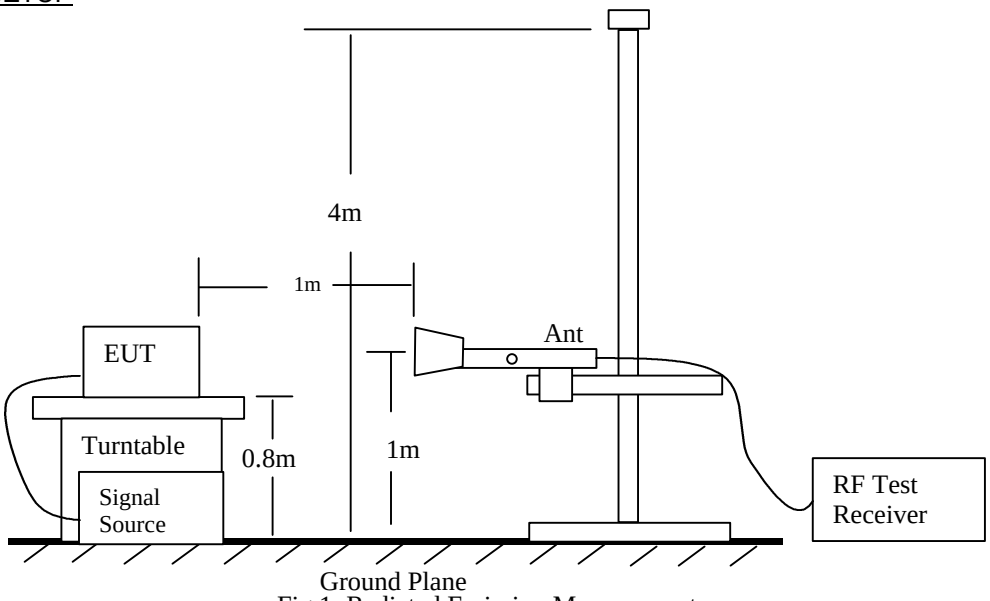


Fig 1: Radiated Emission Measurement

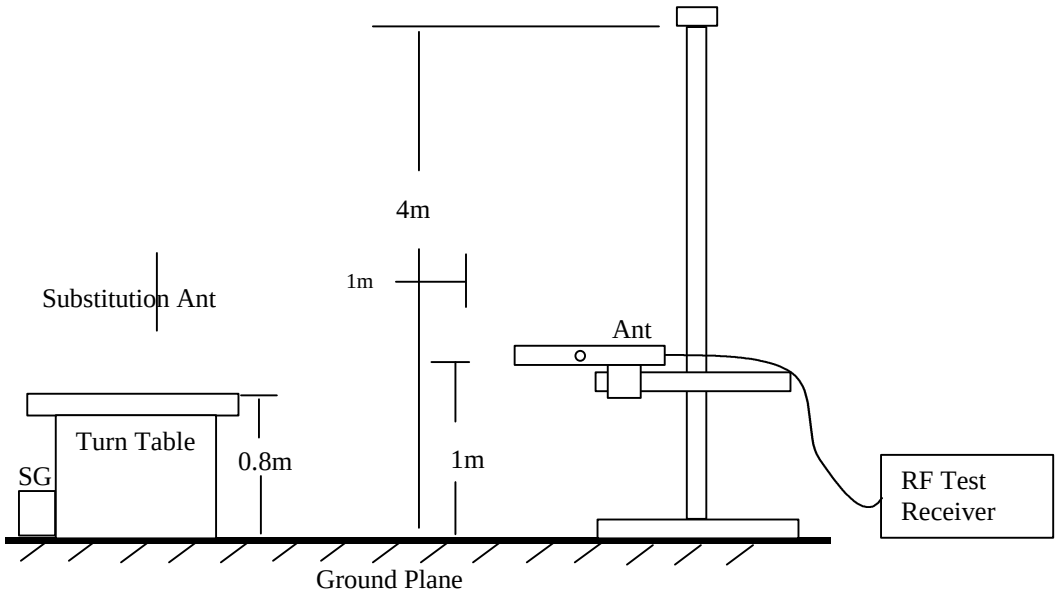


Fig 2: Radiated Emission – Substitution Method set-up

TEST PROCEDURE

1). On a test site, the EUT shall be placed on a turntable, and in the position closest to the normal use as declared by the user.
2). The test antenna shall be oriented initially for vertical polarization located 1m from the EUT to correspond to the frequency of the transmitter.
3). The output of the test antenna shall be connected to the measuring receiver and either a peak or average detector was used for the measurement as indicated on the report. The detector selection is based on how close the emission level was approaching the limit.
4). The transmitter shall be switched on, if possible, without the modulation and the measurement receiver shall be tuned to the frequency of the transmitter under test.
5). The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
6). The transmitter shall than be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
7). The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.
8). The maximum signal level detected by the measuring receiver shall be noted, set RBW and VBW to 1MHz.
9). The transmitter shall be replaced by a substitution antenna.
10). The substitution antenna shall be oriented for vertical polarization.
11). The substitution antenna shall be connected to a calibrated signal generator.
12). If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
13). The test antenna shall be raised and lowered through the specified range of the height to ensure that the maximum signal is received.
14). The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuation setting of the measuring receiver.
15). The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.
16). The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization.
17). The measure of the effective radiated power is the larger of the two levels recorded, at the input to the substitution antenna, corrected for the gain of the substitution antenna if necessary.

RESULT

No non-compliance noted:

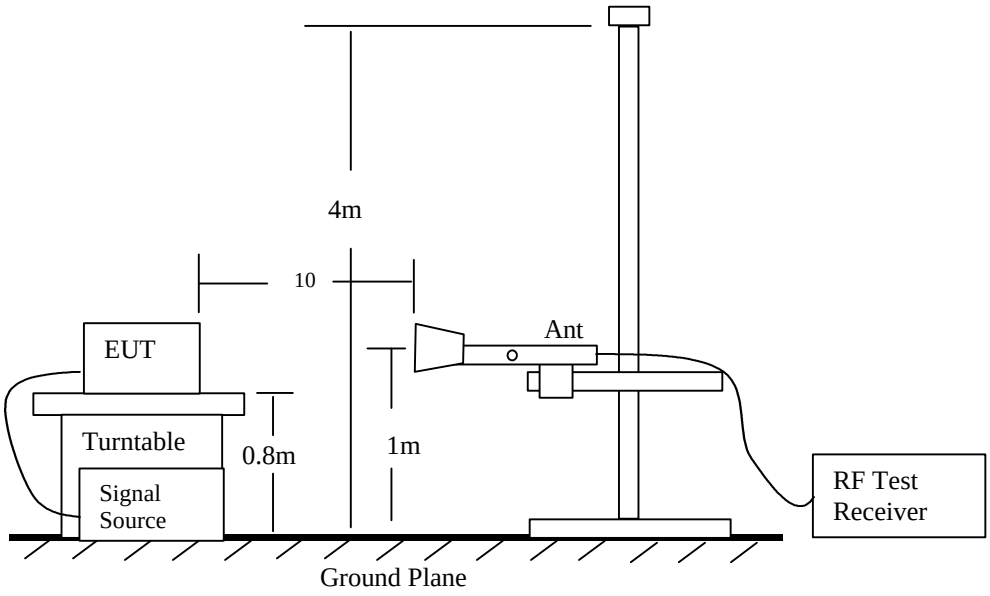
Description of Test:				Radiated Emissions						
Project Number:				03U1802-1						
Date:				02/10/03						
Test Engineer:				Frank Ibrahim						
Company:				Powerwave Tecnologies						
EUT Description:				1930-1990 MHz GSM/EDGE Single Channel 30W RF Amplifier						
Model:				SPA9321-30C						
Test Configuration:				EUT, 2 DC Power Supplies, Power meter, Power sensor, Attenuator, SG						
Mode of Operation:				EUT amplifying at low channel						
EUT Distance:				1.1	meters					
Freq	**Pol**	**Det**	**SA**	**SG Reading**	**Cable Loss**	**Ant Gain**	**EIRP**	**Limit**	**Margin**	**Notes**
GHz	**V/H**		**dBuV**	**dBm**	**dB**	**dBi**	**dBm**	**dBm**	**dB**	
3.860	H	Peak	69.1	-44.4	0.8	9.0	-36.2	-13.0	-23.2	2nd Harmonic
5.790	H	Peak	55.6	-59.7	1.0	10.4	-50.3	-13.0	-37.3	3rd Harmonic
7.720	H	Peak	55.6	-71.7	1.2	10.5	-62.4	-13.0	-49.4	Noise Floor
9.650	H	Peak	56.4	-71.7	1.4	11.0	-62.1	-13.0	-49.1	Noise Floor
11.580	H	Peak	53.6	-69.7	1.5	12.2	-59.0	-13.0	-46.0	Noise Floor
13.510	H	Peak	59.8	-47.7	1.6	11.4	-37.9	-13.0	-24.9	Noise Floor
15.440	H	Peak	57.7	-54.7	1.8	13.6	-42.9	-13.0	-29.9	Noise Floor
17.370	H	Peak	57.2	-55.7	2.0	10.4	-47.3	-13.0	-34.3	Noise Floor
19.300	H	Peak	62.0	-50.0	2.1	8.9	-43.2	-13.0	-30.2	Noise Floor
3.860	V	Peak	78.1	-33.2	0.8	9.0	-25.0	-13.0	-12.0	2nd Harmonic
5.790	V	Peak	67.5	-44.2	1.0	10.4	-34.8	-13.0	-21.8	3rd Harmonic
7.720	V	Peak	53.0	-72.0	1.2	10.5	-62.7	-13.0	-49.7	Noise Floor
9.650	V	Peak	55.3	-74.7	1.4	11.0	-65.1	-13.0	-52.1	Noise Floor
11.580	V	Peak	53.2	-71.7	1.5	12.2	-61.0	-13.0	-48.0	Noise Floor
13.510	V	Peak	57.6	-56.7	1.6	11.4	-46.9	-13.0	-33.9	Noise Floor
15.440	V	Peak	57.6	-64.7	1.8	13.6	-52.9	-13.0	-39.9	Noise Floor
17.370	V	Peak	58.3	-53.7	2.0	10.4	-45.3	-13.0	-32.3	Noise Floor
19.300	V	Peak	64.5	-48.0	2.1	8.9	-41.2	-13.0	-28.2	Noise Floor
SA settings:										
RBW = 1MHz, VBW = 1MHz, Atten = 20dB, Ref Level = 117 dBuV, Ref Level offset = 0dB										

Description of Test:				Radiated Emissions						
	Project Number:			03U1802-1						
			Date:	02/10/03						
	Test Engineer:			Frank Ibrahim						
		Company:		Powerwave Tecnologies						
EUT Description:				1930-1990 MHz GSM/EDGE Single Channel 30W RF Amplifier						
		Model:		SPA9321-30C						
Test Configuration:				EUT, 2 DC Power Supplies, Power meter, Power sensor, Attenuator, SG						
Mode of Operation:				EUT amplifying at mid channel						
	EUT Distance:			1.1	meters					
Freq	**Pol**	**Det**	**SA**	**SG Reading**	**Cable Loss**	**Ant Gain**	**EIRP**	**Limit**	**Margin**	**Notes**
GHz	**V/H**		**dBuV**	**dBm**	**dB**	**dBi**	**dBm**	**dBm**	**dB**	
3.920	H	Peak	75.0	-32.1	0.8	9.0	-23.9	-13.0	-10.9	2nd Harmonic
5.880	H	Peak	56.5	-70.0	1.0	10.4	-60.6	-13.0	-47.6	Noise Floor
7.840	H	Peak	57.1	-71.7	1.2	10.5	-62.4	-13.0	-49.4	Noise Floor
9.800	H	Peak	56.1	-71.7	1.4	11.0	-62.1	-13.0	-49.1	Noise Floor
11.760	H	Peak	55.3	-69.7	1.5	12.2	-59.0	-13.0	-46.0	Noise Floor
13.720	H	Peak	59.6	-47.7	1.6	11.4	-37.9	-13.0	-24.9	Noise Floor
15.680	H	Peak	58.6	-54.7	1.8	13.6	-42.9	-13.0	-29.9	Noise Floor
17.640	H	Peak	58.3	-55.7	2.0	10.4	-47.3	-13.0	-34.3	Noise Floor
19.600	H	Peak	61.3	-50.0	2.1	8.9	-43.2	-13.0	-30.2	Noise Floor
3.920	V	Peak	70.1	-35.9	0.8	9.0	-27.7	-13.0	-14.7	2nd Harmonic
5.880	V	Peak	62.4	-51.7	1.0	10.4	-42.3	-13.0	-29.3	3rd Harmonic
7.840	V	Peak	62.5	-50.7	1.2	10.5	-41.4	-13.0	-28.4	4th Harmonic
9.800	V	Peak	54.7	-74.7	1.4	11.0	-65.1	-13.0	-52.1	Noise Floor
11.760	V	Peak	55.7	-71.7	1.5	12.2	-61.0	-13.0	-48.0	Noise Floor
13.720	V	Peak	60.3	-56.7	1.6	11.4	-46.9	-13.0	-33.9	Noise Floor
15.680	V	Peak	59.1	-64.7	1.8	13.6	-52.9	-13.0	-39.9	Noise Floor
17.640	V	Peak	59.0	-53.7	2.0	10.4	-45.3	-13.0	-32.3	Noise Floor
19.600	V	Peak	61.0	-48.0	2.1	8.9	-41.2	-13.0	-28.2	Noise Floor
SA settings:										
RBW = 1MHz, VBW = 1MHz, Atten = 20dB, Ref Level = 117 dBuV, Ref Level offset = 0dB										

Description of Test:				Radiated Emissions						
	Project Number:			03U1802-1						
			Date:	02/10/03						
	Test Engineer:			Frank Ibrahim						
		Company:		Powerwave Tecnologies						
EUT Description:				1930-1990 MHz GSM/EDGE Single Channel 30W RF Amplifier						
		Model:		SPA9321-30C						
Test Configuration:				EUT, 2 DC Power Supplies, Power meter, Power sensor, Attenuator, SG						
Mode of Operation:				EUT amplifying at high channel						
	EUT Distance:			1.1	meters					
Freq	**Pol**	**Det**	**SA**	**SG Reading**	**Cable Loss**	**Ant Gain**	**EIRP**	**Limit**	**Margin**	**Notes**
GHz	**V/H**		**dBuV**	**dBm**	**dB**	**dBi**	**dBm**	**dBm**	**dB**	
3.980	H	Peak	73.7	-32.7	0.8	9.0	-24.5	-13.0	-11.5	2nd Harmonic
5.970	H	Peak	57.1	-70.0	1.0	10.4	-60.6	-13.0	-47.6	Noise Floor
7.960	H	Peak	56.3	-71.7	1.2	10.5	-62.4	-13.0	-49.4	Noise Floor
9.950	H	Peak	56.2	-71.7	1.4	11.0	-62.1	-13.0	-49.1	Noise Floor
11.940	H	Peak	55.3	-69.7	1.5	12.2	-59.0	-13.0	-46.0	Noise Floor
13.930	H	Peak	60.0	-47.7	1.6	11.4	-37.9	-13.0	-24.9	Noise Floor
15.920	H	Peak	60.0	-54.7	1.8	13.6	-42.9	-13.0	-29.9	Noise Floor
17.910	H	Peak	58.9	-55.7	2.0	10.4	-47.3	-13.0	-34.3	Noise Floor
19.900	H	Peak	64.5	-50.0	2.1	8.9	-43.2	-13.0	-30.2	Noise Floor
3.980	V	Peak	73.9	-30.7	0.8	9.0	-22.5	-13.0	-9.5	2nd Harmonic
5.970	V	Peak	66.2	-40.7	1.0	10.4	-31.3	-13.0	-18.3	3rd Harmonic
7.960	V	Peak	63.0	-49.7	1.2	10.5	-40.4	-13.0	-27.4	4th Harmonic
9.950	V	Peak	56.2	-74.7	1.4	11.0	-65.1	-13.0	-52.1	Noise Floor
11.940	V	Peak	55.3	-71.7	1.5	12.2	-61.0	-13.0	-48.0	Noise Floor
13.930	V	Peak	60.0	-56.7	1.6	11.4	-46.9	-13.0	-33.9	Noise Floor
15.920	V	Peak	60.0	-64.7	1.8	13.6	-52.9	-13.0	-39.9	Noise Floor
17.910	V	Peak	58.9	-53.7	2.0	10.4	-45.3	-13.0	-32.3	Noise Floor
19.900	V	Peak	64.5	-48.0	2.1	8.9	-41.2	-13.0	-28.2	Noise Floor
SA settings:										
RBW = 1MHz, VBW = 1MHz, Atten = 20dB, Ref Level = 117 dBuV, Ref Level offset = 0dB										

6.5. RADIATED EMISSIONS, FCC PART 15, SECTIONS 209 & 205

TEST SETUP



Test Procedures

The EUT was placed on a wooden table 80 cm above the ground screen. The antenna to EUT distance was 10 meters from the leading edge of the turntable to the antenna for the frequency range of 30-1000 MHz, and 1m from the center of the EUT to the horn antenna for the frequency range of 1-20 GHz. During the test, the table was rotated 360 degrees to maximize emissions and the antenna was positioned from 1 to 4 meters above the ground screen to further maximize emissions. Measurements were made with the antenna polarized in both the vertical and the horizontal positions.

The EUT test configuration was according to Section 8 of ANSI C63.4.

The following procedure was used to make the measurements: The frequency range of interest was monitored at a fixed antenna height and EUT azimuth. The Frequency span was set small enough to easily differentiate between broadcast stations, intermittent ambient signals and EUT emissions. The EUT was rotated through 360 degrees to maximize emissions received. During the rotation if emission increased by more than 1 dB, or if another emission appeared that was greater by 1 dB, the EUT was returned to the azimuth where the maximum occurred, and additional cable manipulation was performed to further maximize received emissions.

The antenna was moved up and down to further maximize the suspected highest amplitude signal. If the emission increased by 1 dB or more, or if another emission appeared that was greater by 1dB or more, the antenna was returned to the height where maximum signal was observed, and, cables were manipulated to produce highest emissions, noting frequency and amplitude.

RESULT

No non-compliance noted:

02/10/03 **High Frequency Measurement**
Compliance Certification Services, Morgan Hill Open Field Site

Test Engr:	Frank Ibrahim
Project #:	03U1802-1
Company:	Powerwave Technologies
EUT Descrip.:	1930-1990 MHz GSM/EDGE Single Channel 30W RF Amplifier
EUT M/N:	SPA9321-30C
Test Target:	FCC 15.209
Mode Oper:	EUT amplifying at mid-channel, full power

Test Equipment:

Cable (feet)	EMCO Horn 1-18GHz	Pre-amplifer 1-26GHz	Spectrum Analyzer	Horn > 18GHz
	T72; S/N: 6739 @1m	HP 8449B	8566B Analyzer	T87; ARA 18-26GHz; S/N:1049

Peak Measurements:
1 MHz Resolution Bandwidth
1MHz Video Bandwidth

Average Measurements:
1 MHz Resolution Bandwidth
10Hz Video Bandwidth

f GHz	Dist feet	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes
2.000	3.6	45.9	35.2	28.7	1.5	-36.2	-8.7	1.0	32.2	21.5	74.0	54.0	-41.8	-32.5	V, Noise Floor
4.000	3.6	47.8	38.9	33.3	2.5	-35.1	-8.7	1.0	40.8	31.9	74.0	54.0	-33.2	-22.1	V, Noise Floor
6.000	3.6	54.5	44.0	35.1	3.0	-34.5	-8.7	1.0	50.4	39.9	74.0	54.0	-23.6	-14.1	V, Noise Floor
8.000	3.6	53.2	44.5	38.0	4.0	-34.7	-8.7	1.0	52.7	44.0	74.0	54.0	-21.3	-10.0	V, Noise Floor
10.000	3.6	54.9	44.7	38.6	4.5	-34.5	-8.7	1.0	55.8	45.6	74.0	54.0	-18.2	-8.4	V, Noise Floor

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

COMPLIANCE Certification Services

FCC, VCCI, CISPR, CE, AUSTEL, NZ
UL, CSA, TUV, BSMI, DHHS, NVLAP

561F MONTEREY ROAD, SAN JOSE, CA 95037-9001
PHONE: (408) 463-0885 FAX: (408) 463-0888

Project #:	03U1802-2
Report #:	030210A01
Date& Time:	02/10/03 9:43 AM
Test Engr:	Frank Ibrahim

Company:	Powerwave Technologies
EUT Description:	1930-1990 MHz GSM/EDGE Single Channel 30W RF Amplifier, Model: SPA9321-30C
Test Configuration :	EUT, 2 DC power supplies, SG, Power Meter, Attenuator, Power Sensor
Type of Test:	EN 55022 CLASS B
Mode of Operation:	EUT amplifying a 1960 MHz signal, Power meter reading = 45.8 dBm

<< Main Sheet

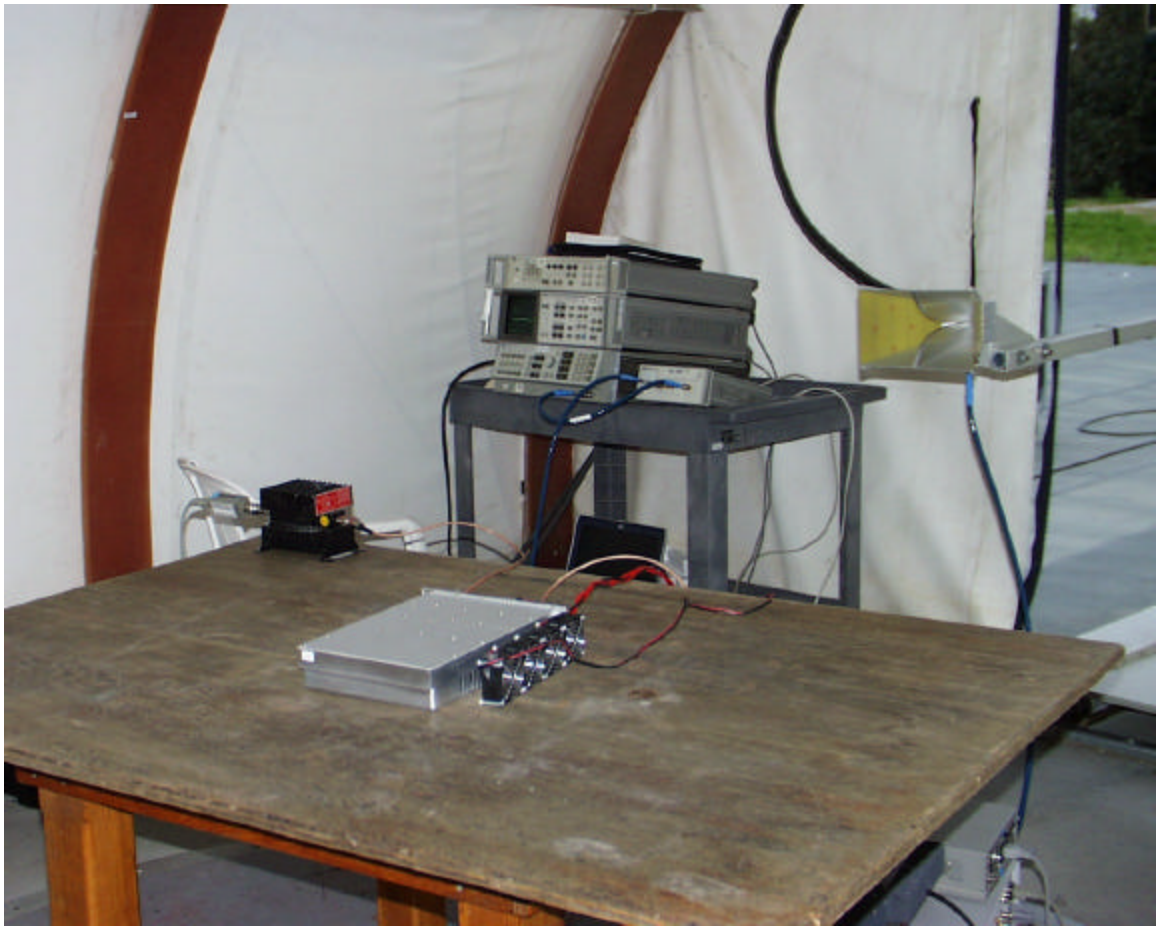
Freq. (MHz)	Reading (dBuV)	AF (dB)	Closs (dB)	Pre-amp (dB)	Level (dBuV/m)	Limit EN_B	Margin (dB)	Pol (H/V)	Az (Deg)	Height (Meter)	Mark (P/Q/A)
390.10	45.20	15.53	3.21	27.20	36.74	37.00	-0.26	10mV	0.00	1.00	QP
378.10	45.10	15.42	3.15	27.11	36.56	37.00	-0.44	10mV	0.00	1.00	QP
354.10	45.20	15.20	3.04	26.93	36.51	37.00	-0.49	10mV	0.00	1.00	QP
366.10	45.00	15.31	3.10	27.02	36.39	37.00	-0.61	10mV	0.00	1.00	QP
342.10	44.50	15.09	2.99	26.85	35.74	37.00	-1.26	10mV	0.00	1.00	QP
432.10	43.20	16.37	3.39	27.41	35.55	37.00	-1.45	10mV	0.00	1.00	QP
6 Worst Data											

Note: All the signals above are found to be from the support equipment and they are not influenced by EUT

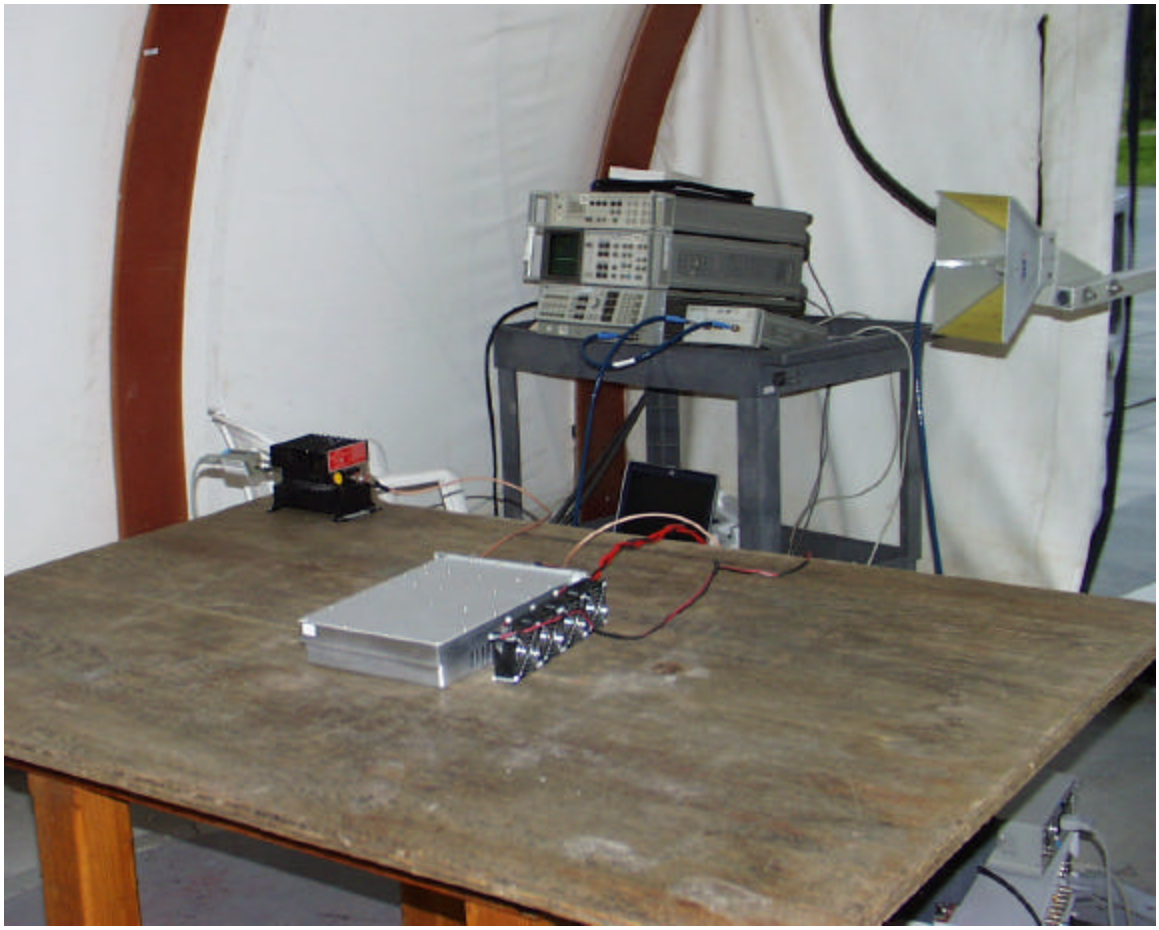
7. EUT SETUP PHOTOS

CONDUCTED RF MEASUREMENTS

HIGH FREQUENCY, VERTICAL POLARIZATION



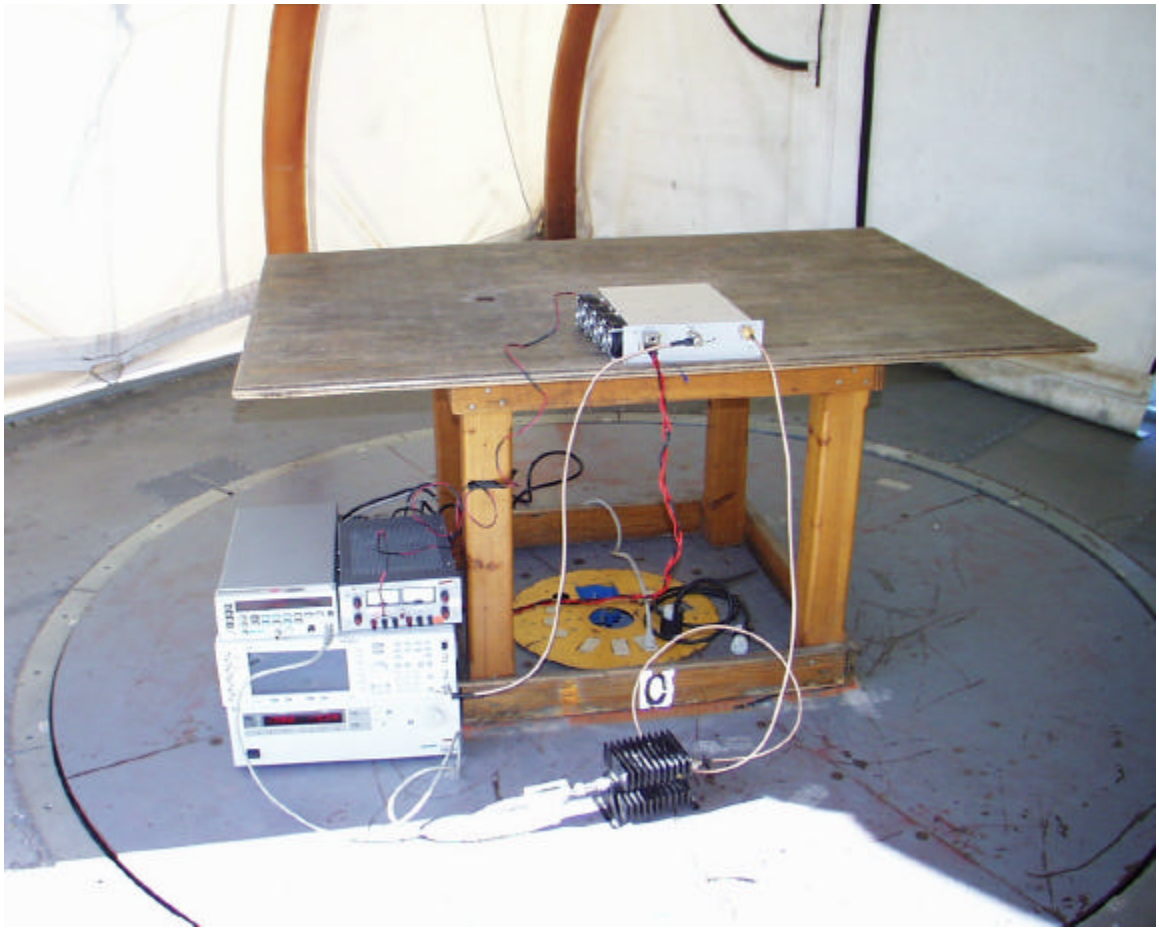
HIGH FREQUENCY, HORIZONTAL POLARIZATION



SUBSTITUTION MEASUREMENT, VERTICAL POLARIZATION

SUBSTIUTION MEASUREMENT, HORIZONTAL POLARIZATION

RADIATED EMISSIONS, LOW FREQUENCY (30-1000) MHz, Front View



COMPLIANCE CERTIFICATION SERVICES DOCUMENT NO:CCSUP4031A
561F Monterey Rd., Morgan Hill, CA 95037-9001, USA TEL:(408) 752-8166 FAX:(408) 752-8168

RADIATED EMISSIONS, LOW FREQUENCY (30-1000) MHz, Rear View

END OF REPORT

COMPLIANCE CERTIFICATION SERVICES DOCUMENT NO:CCSUP4031A
561F Monterey Rd., Morgan Hill, CA 95037-9001, USA TEL:(408) 752-8166 FAX:(408) 752-8168